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OF 3
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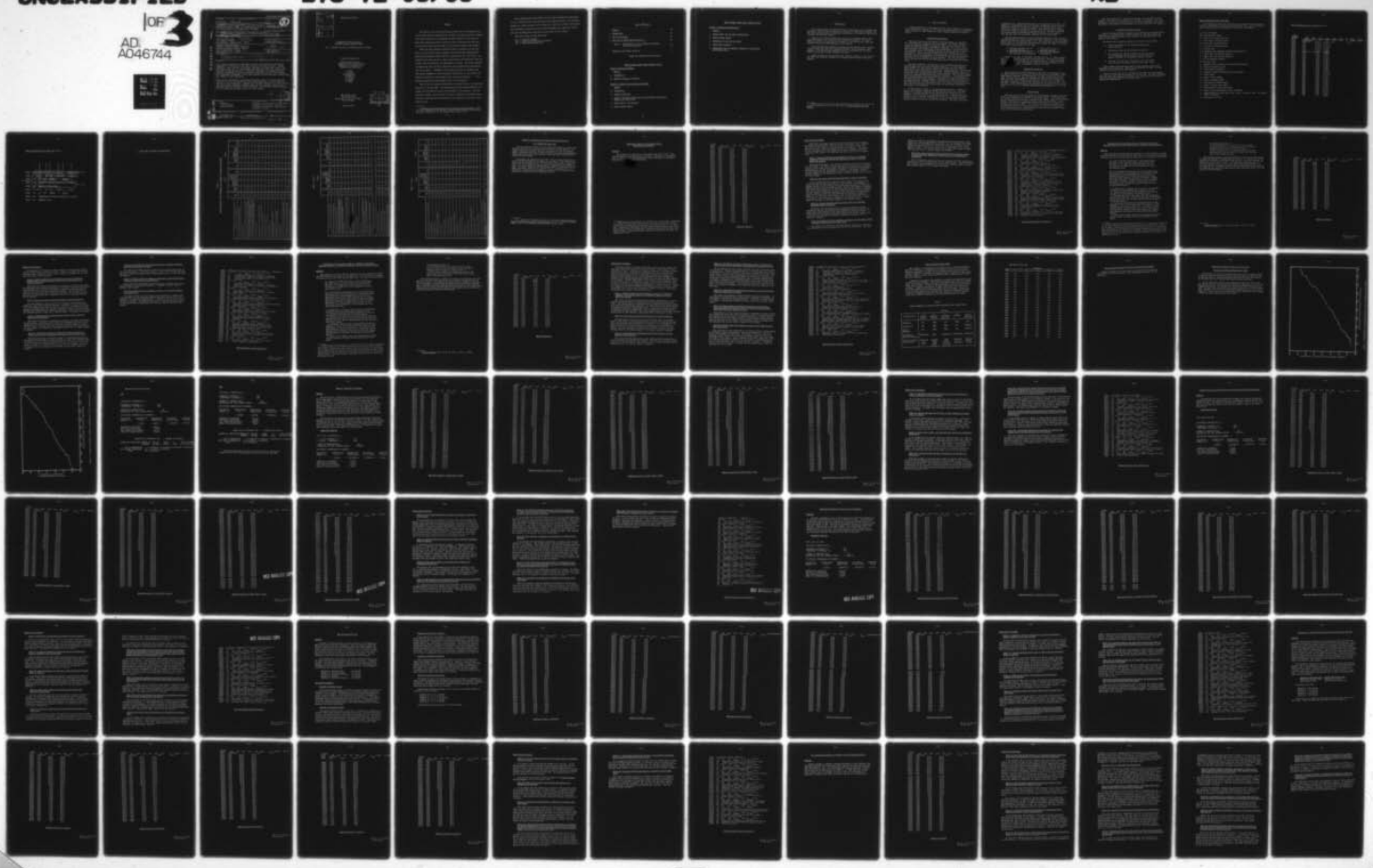

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16. Abstract

This study updated and expanded the five socioeconomic scenarios prepared for the FAA in the prior study similarly titled. These scenarios were revised to reflect changes in conditions since the original study and to incorporate new material that may better aid the FAA in policy analysis. Scenario sections on economics were greatly augmented to give substantive descriptions of the economic and financial processes, and a new sector on international conditions was added to each scenario.

This volume discusses the methods and data used in making the projections of the 46 variables which were selected to give quantification to the scenarios. Though the revised scenarios do not discuss the future NAS, Federal expenditures for non-defense aeronautical research and development were projected, and the data used in making this projection are also given in this volume.

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Report 276-72-05/03

ALTERNATIVE FUTURE SCENARIOS FOR THE NATIONAL AVIATION SYSTEM

Vol. 3: Methods and Data for Projecting the Variables

A report prepared for

System Concepts Branch
Federal Aviation Administration
Department of Transportation
Contract DOT FA6WA-3855

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PREFACE

This volume is one of four covering the work done in revising the five socioeconomic scenarios developed for the FAA in the study entitled, "Alternative Future Scenarios for the National Aviation System."* That study was directed at depicting various alternative future conditions that may exist in the United States and may impact on the National Aviation System (NAS).

While the basic positions differentiating the scenarios are the same here as in the previous study, insights into socioeconomic changes gained during the preceding 18 months have been incorporated into this study. New variables have been selected to better characterize the alternative "external worlds" which may influence the development of the NAS. New events important to shaping the nature of these worlds have been identified and incorporated into the scenarios. Furthermore, the scenario sections on economics have been greatly augmented to give substantive descriptions of the economic and financial processes in each scenario and a new section dealing with international conditions has been added to each of the scenarios.

Each of the five scenarios describes an alternative path of socioeconomic evolution to the year 2000. The appropriate NAS that was described for each scenario in the previous study is not included in this revision. The five scenarios, however, can be used as the point of departure from which the appropriate future NAS may be developed for each scenario, as was done in the previous study.

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*Alternative Future Scenarios for the National Aviation System, Report 174-72-01, prepared for the Systems Concepts Branch, Federal Aviation Administration (Glastonbury, CT: The Futures Group, August 1975).

This volume discusses the methods and data used in making the projections of the 46 variables which were selected to give quantification to the scenarios. Though the revised scenarios do not discuss the future NAS, Federal expenditures for non-defense aeronautical research and development were projected, and the data used in making this projection are also given in this volume.

The other volumes in this series are

Vol. 1: Executive Summary
Vol. 2: Scenario Descriptions and Graphics
Vol. 4: Supporting Documentation

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5. COMPARATIVE LIST OF VARIABLES PROJECTED IN THE REVISED AND ORIGINAL STUDY

1. INTRODUCTION

This volume presents the method and data by which each of the variables was projected.* Most of the variables were projected by trend impact analysis, and for these variables there is presented a discussion of the baseline used and the rationale for the event impacts.

Certain of the other variables were projected by assuming growth rates which were chosen to be consistent with scenario development. For these variables there is a discussion of the manner in which the growth rates were selected and how they were assigned to each scenario.

A few variables were computed by regressing them against other variables or by deriving them from other variables through a direct alegebraic relationship. For each of these variables there is a discussion of the techniques used and the relevant equations are shown.

A page location for the variables may be found in Table 1 on pp. 3.2-3.4. The table also presents a summary of the methods used for each of the projections.

*Tables and plots of each of the projections are found at the end of the scenario narratives in Vol. 2 of this report, Scenario Descriptions and Graphics.

2. THE TIA PROCEDURE

A full discussion of trend impact analysis will be found in the appendix. A few observations, however, will be helpful in understanding the information that is provided in this chapter for those variables which were projected by TIA.

Developing the Baseline

The first step in the TIA process is the development of a baseline (or a surprise-free) projection for the variable. The normal approach is to use the computer program to select the "best-fitting" curve to the historical data from a set of alternative equations. This curve is then used to provide the surprise-free future extrapolation. The baseline is then perturbed in the TIA program by the set of events selected to impact the variable. Where, as in the present work, each variable is to be projected for a set of scenarios, the same baseline may be used for each scenario, but the perturbations, as determined by the event probabilities and impact, will be different for each scenario. Thus the projections of the variable will reflect the differing scenario conditions and assumptions.

The need to project a variable for a set of substantially different scenarios may require the use of separate baselines. In defining the basic movement for each scenario certain prime variables (e.g., GNP and population in this study) may be projected by postulating their future growth rates rather than by projecting them by TIA. Separate baselines may be required for those variables which are closely related to such a prime variable in order to maintain consistency among the projections. The delineation for these variables among the scenarios must be related to the projections of the prime variable for each scenario. Therefore, if these variables are to be projected by TIA, baselines must be selected which follow the growth of the prime variable. The TIA process, then, will compute perturbations about each baseline, thereby further quantifying the projections according to the nature of each scenario.

If the decision is made to use separate baselines for a variable in each of the scenarios, there are several methods one may use. The most obvious is to simply extrapolate the historical data based strictly on judgment. This was not used in the current project. A more rigorous option would be to "key" the variables in question to an assumed (or given) variable in each scenario. For example, in the current project GNP was assumed to grow at a certain rate in each scenario. Thus one could relate

a variable (e.g., industrial production) to the assumed level of GNP. One method for accomplishing this is to estimate a regression equation using historical values for the variable and the prime variable (e.g., make industrial production a function of GNP). Once the equation is obtained it is quite simple to estimate future values of the variable by putting the prime variable (differentiated among scenarios) into the equation. This approach was used for several variables in the current work.

Another simple approach to obtain separate baselines for one indicator for each scenario is to use a "growth rate ratio" approach. Since the future growth rates for the given variable (e.g., GNP) are known, and the historical growth rates for the indicator and the given variable are known, one can set up a simple ratio equality of the form:

$$\frac{A\ \text{historical growth rates of the given variable}}{B\ \text{historical growth rates of the indicator to be projected}} = \frac{C\ \text{future growth rates of the given variable}}{D\ \text{future growth rates of the indicator}}$$

Since A, B, and C are known, one may solve for D. This estimate will be the estimated growth rate of the indicator. One would then apply this growth rate to the indicator and thereby generate a baseline extrapolation and since the future growth rates of the given variable are different among scenarios, a baseline is produced for each.

Probability Selection

The second step in the TIA process is the choice of probabilities for the events which will influence the future behavior of the variable. These probabilities represent the likelihood of the event occurring by a given date. They will be, in general, different for each scenario because the different basic assumptions for each scenario influence the likelihood of the event occurring. Probabilities were selected for the years 1980, 1990, and 2000. A full discussion of the rationale for the probabilities for the major events is given in Scenario Descriptions and Graphics, Vol. 2 of this study.

Event Impacts

The third step in the TIA process is the assigning of impacts which will affect the behavior of the variable if the event occurs. In few cases can an accurate computation be made to determine the impact. More often, judgment will be necessary to provide the necessary impact quantification. Often, however, some numerical assumptions and calculations will be helpful in assigning the level of impact. For each of the variables projected by TIA, the rationale which led to the chosen impact is given for the key events of the scenarios and for a selected set of events which have special relevance to the National Aviation System.

The event impacts for a variable are assumed to be the same for each scenario. The impact of the event on the variable is weighted by the event probability, and since the probabilities are scenario-dependent, the resulting effect of the impact on the variable will be different for each scenario.

Baselines and TIA Input Data

The set of events chosen to impact a given variable is the same for all scenarios. The probabilities for the occurrence of the event differ for each scenario, while the impact of the event on the variable remains the same for each scenario.

For each of the variables projected by TIA there will be found:

a. A brief discussion of the baseline extrapolation used in the TIA.

b. The historic data and the baseline projection.

c. The rationale for the event impact for the key events of the scenarios and for a set of selected events of special relevance to the National Aviation System.

d. The input for each TIA. This lists all of the events used and gives the numbers defining each event impact.

Where separate baselines were used for each scenario, each of the baselines are so identified. Where only one baseline is shown, the same baseline was used for all of the scenarios.

Since the event impacts on a variable are the same for each scenario, only the input data sheet for Scenario A will be found. The event probabilities for all of the scenarios are listed in the master event list given in Supporting Documentation, Vol. 4 of this study.

KEY TO BASELINE AND TIA INPUT DATA

The baseline and TIA input data may be read directly from the computer print-out reproduced for each variable projected by TIA. The following key can be used as a guide to locating all the relevant information.

A_1 = TIA file number

A_2 = TIA indicator series

B = first year of historical data

C = last year of historical data

D = first year of projected data

E = last year of projected data

F = current year

G = designates the baseline equation (see Appendix A)

H = lower limit for baseline equation

I = upper limit for baseline equation

J = R^2 for baseline equation

K = historic data

L = baseline fitted values for the historic time period

M = baseline projected values

N = trend name and scenario

O = computer program instructions (see TIA manual)

P = event number

Q = years to first impact

R = years to maximum impact

S = percentage of maximum impact

T = years to steady state impact

U = percentage of steady state impact

V = years to which probabilities will correspond

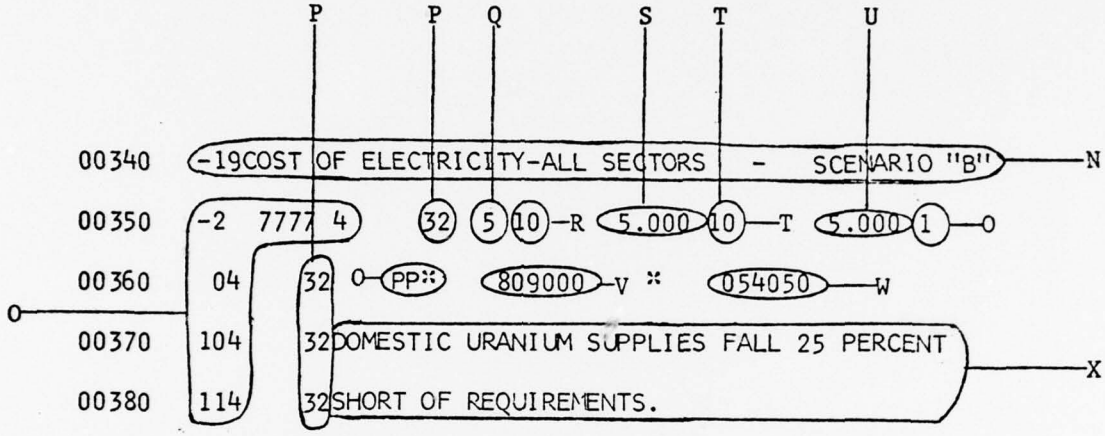
W = probabilities for given years; e.g., 1980 = 5 percent, 1990 = 40 percent, 2000 = 50 percent

X = wording of the event

KEY TO BASELINE AND TIA INPUT DATA (Cont.)

	A_1	A_2	B	C	D	E	F	G	H	I
00010	FA2006	1006	1970	1975	1976	2000	1976	1	0.000	5.000
00020		0.65724084				0.04		-0.11		
00030	1970	J		2.47	2.47					
00040	1971			2.54	2.51					
00050	1972			2.57 -K	2.55 -L					
00060	1973			2.53	2.58					
00070	1974			2.56	2.62					
00080	1975			2.72	2.66					
00090	1976			0.00	2.69					
00100	1977			0.00	2.73					
00110	1978			0.00	2.77					
00120	1979			0.00	2.80					
00130	1980			0.00	2.84					
00140	1981			0.00	2.88					
00150	1982			0.00	2.92					
00160	1983			0.00	2.95					
00170	1984			0.00	2.99					
00180	1985			0.00	3.03					
00190	1986			0.00	3.06					
00200	1987			0.00	3.10					
00210	1988			0.00	3.14 -M					
00220	1989			0.00	3.17					
00230	1990			0.00	3.21					
00240	1991			0.00	3.25					
00250	1992			0.00	3.28					
00260	1993			0.00	3.32					
00270	1994			0.00	3.36					
00280	1995			0.00	3.40					
00290	1996			0.00	3.43					
00300	1997			0.00	3.47					
00310	1998			0.00	3.51					
00320	1999			0.00	3.54					
00330	2000			0.00	3.58					

KEY TO BASELINE AND TIA INPUT DATA (Cont.)



3. DATA USED IN MAKING THE PROJECTIONS

Table 1

PAGE LOCATION OF THE VARIABLES AND SUMMARY OF PROJECTION METHODS

		BASELINE				SCENARIO				
DOMESTIC VARIABLES	Page No.	Fit to Historic Data	Regressed Against Another Variable	Growth Rate Ratioed to Growth Rate of Another Variable	Other	TIA	Assumed Growth Rates	Regressed Against Another Variable	Identity Relationship	Other
Total U.S. Population (Including Armed Forces Abroad)	3.5									X
U.S. Population Ages 18-64	3.5									X
Population Living in the Combined South and West Census Regions	3.6	X				X				
Population Living in Urban Areas as a Percent of the Total Resident Population in the Combined South and West Census Regions	3.11	X				X				
Population Living in Urban Areas as a Percent of the Total Resident Population of Combined Northeast and North Central Regions	3.17	X				X				
Gross National Product (GNP)	3.23						X			
Gross National Product Per Capita (Constant 1975 dollars)	3.25								X	
Disposable Personal Income (DPI) Per Capita	3.26							X		
Personal Consumption Expenditures (PCE)	3.26							X		
Index of Industrial Production	3.31		X			X				
Output Per Hour of All Persons in the Private Non-Farm Business Sector	3.40		X			X				
Business Expenditures on New Plant and Equipment	3.50		X			X				
AAA Corporate Bond Rate	3.59				X	X				
Percentage of Investment Funds Generated Internally by Business	3.69			X		X				
All Government Spending as a Percent of Gross National Product	3.78	X				X				
Long-Term Funds Raised by Business in Credit Markets	3.86		X			X				

Table 1 (Cont.)

DOMESTIC VARIABLES (Cont.)	Page No.	BASELINE: Fit to Historic Data	BASELINE: Regressed Against Another Variable	BASELINE: Growth Rate Ratioed to Growth Rate of Another Variable	BASELINE: Other	SCENARIO: TIA	SCENARIO: Assumed Growth Rates	SCENARIO: Regressed Against Another Variable	SCENARIO: Identity Relationship	SCENARIO: Other
Final Sales of Goods as a Percent of Total Final Sales	3.95			X		X				
Average Revenues Per Kilowatt-Hour, All Sectors	3.104	X				X				
Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products	3.109	X				X				
Capital Expenditures by Business for Air and Water Pollution Abatement	3.117	X				X				
All Social Welfare Spending as a Percent of Gross National Product	3.122	X				X				
Unemployment	3.127									X
Average Weekly Hours of Production Workers on Private Non-Agricultural Payrolls	3.132								X	
Labor Force Participation Rate	3.135	X				X				
Civilian Labor Force	3.140								X	
Median Number of Years of School Completed by the Civilian Non-Institutional Population 25 Years and Over	3.141	X				X				
Personal Consumption Expenditures for Transportation (Goods and Services)	3.145		X			X				
Personal Consumption Expenditures for Recreation (Goods and Services)	3.154		X			X				
INTERNATIONAL VARIABLES										
U.S. Exports to the European Community	3.162	X				X				
U.S. Imports from the European Community	3.170	X				X				
U.S. Investments in the European Community	3.176	X				X				
European Community Investments in the United States	3.182	X				X				

Table 1 (Cont.)

		BASELINE				SCENARIO				
INTERNATIONAL VARIABLES (Cont.)	Page No.	Fit to Historic Data	Regressed Against Another Variable	Growth Rate Ratioed to Growth Rate of Another Variable	Other	TIA	Assumed Growth Rates	Regressed Against Another Variable	Identity Relationship	Other
U.S. Imports from Japan	3.187	X				X				
U.S. Investments in Japan	3.193	X				X				
Japanese Investments in the United States	3.198	X				X				
U.S. Exports to Japan	3.203	X				X				
U.S. Exports to Latin America	3.208	X				X				
U.S. Imports from Latin America	3.214	X				X				
U.S. Investments in Latin America	3.220	X				X				
Latin American Debt to the United States	3.226	X				X				
Price of OPEC Crude Oil	3.232				X	X				
Population of the European Community	3.240						X			
Population of Japan	3.241						X			
Population of Latin America	3.242						X			
Gross Domestic Product of the European Community	3.243						X			
Gross Domestic Product of Japan	3.244						X			
Gross Domestic Product of Latin America	3.245						X			
DOMESTIC AERONAUTICAL VARIABLE										
Federal Expenditures for Non-Defense Aeronautical Research and Development	3.246		X			X				

Total U.S. Population (Including Armed Forces Abroad)

U.S. Population Ages 18-64

The two variables chosen to be the prime differentiators between the scenarios were the U.S. population and the gross national product. As scenario defining variables, they were not subject to the TIA process. Rather, projections for both of these variables were made from assumptions about their growth which were consistent with the basic orientation intended for each scenario.

Projections for population were taken from the three population projection series developed by the Bureau of the Census.[1] The three series start with the estimated July 1, 1974 population and assume a slight reduction in future mortality and an annual net immigration of 400,000 per year. The series differ in assumed average number of lifetime births per woman as follows: Series I--2.7, Series II--2.1, and Series III--1.7. The Series I projection was assumed for Scenarios B and D, Series II for Scenario R, and Series III for Scenarios A and C.

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[1] U.S. Department of Commerce, Bureau of the Census, Current Population Reports: Population Estimates and Projections, Series P-25, No. 601 (Washington, D.C.: U.S. Government Printing Office, October 1975).

Population Living in the Combined South and West* Census Regions

BASELINE

The baseline is a good fit to the historic data ($R^2 = 0.97$). The historic growth rate is continued to the end of the century. Population gains in the South and West giving these areas a majority of the population by the late [illegible] of this decade.

*Four primary census regions are referred to: (1) the South, consisting of the South Atlantic, East South Central, and West South Central states; (2) the West, consisting of the Mountain and Pacific states; (3) the Northeast, consisting of New England and the Middle Atlantic states; and (4) the North Central Division, consisting of the East North Central and West North Central states. The South and West contained 48 percent of the total U.S. population in 1970.

F01000

00010	1000	1950	1975	1976	2000	1976	5	0.000	100.000
00020	0.97157959					-0.00	0.03		
00030	1950		44.25		44.08				
00040	1951		44.74		44.27				
00050	1952		44.77		44.46				
00060	1953		44.62		44.65				
00070	1954		44.50		44.84				
00080	1955		44.77		45.04				
00090	1956		45.09		45.24				
00100	1957		45.44		45.43				
00110	1958		45.64		45.63				
00120	1959		45.91		45.84				
00130	1960		45.95		46.04				
00140	1961		46.49		46.25				
00150	1962		46.81		46.46				
00160	1963		47.01		46.67				
00170	1964		47.15		46.88				
00180	1965		47.24		47.09				
00190	1966		47.25		47.31				
00200	1967		47.29		47.52				
00210	1968		47.43		47.74				
00220	1969		47.62		47.97				
00230	1970		47.66		48.19				
00240	1971		48.06		48.41				
00250	1972		48.41		48.64				
00260	1973		48.88		48.87				
00270	1974		49.28		49.11				
00280	1975		49.61		49.34				
00290	1976		0.00		49.58				
00300	1977		0.00		49.82				
00310	1978		0.00		50.06				
00320	1979		0.00		50.30				
00330	1980		0.00		50.55				
00340	1981		0.00		50.80				
00350	1982		0.00		51.05				
00360	1983		0.00		51.30				
00370	1984		0.00		51.56				
00380	1985		0.00		51.81				
00390	1986		0.00		52.08				
00400	1987		0.00		52.34				
00410	1988		0.00		52.61				
00420	1989		0.00		52.88				
00430	1990		0.00		53.15				
00440	1991		0.00		53.42				
00450	1992		0.00		53.70				
00460	1993		0.00		53.98				
00470	1994		0.00		54.26				
00480	1995		0.00		54.55				
00490	1996		0.00		54.84				
00500	1997		0.00		55.13				
00510	1998		0.00		55.43				
00520	1999		0.00		55.73				
00530	2000		0.00		56.03				

<u>Baseline (percent)</u>

(See p. 2.4 for key
to the data.)

EVENT-IMPACT RATIONALE

Since 1960, net gains in population through migration have averaged approximately 500,000 people per year in the 5 sub-regions which comprise the South and West regions. This represents an increase of about 0.5 percent per year for the total population in these regions. The impacts for the following events were judged on the basis of whether they would be greater than, equal to, or less than one year's gain or loss in migration.

Event 7. Federal Guidelines Are Developed to Serve as a Voluntary Framework for Planning Population Distribution among the Various States and Regions.

This event would give a more balanced population distribution throughout the country. The intent of the event is to provide population pressure relief in those areas of the country constrained by problems of environment, transportation, and the availability of energy. A relatively long period will be required to see the effects of such voluntary changes, but the ultimate impact will be significant, and a +1 percent change in the variable has been assumed.

Event 10. New Cities Are Developed Proximate to Natural Resources.

It was established that a new city would consist of a population of 50,000 and that the event implied that 5 were created. This impact on regional growth will be due not only to the added population of these new cities, but also to the increased economic activity and demand for services which would be stimulated in the areas in which they are formed. Assuming that all of these cities will be in the South and West, that they attract an equal number of additional residents into these areas, and that people drawn to the cities from the South and West are replaced by added in-migration from the rest of the country, the net population gain will be 0.5 percent. Such cities may be expected to be developed within a decade under the influence of the high demand for raw material outputs.

Event 53. Capital Resources Are Not Able to Meet the Long-Term Investment Needs of Industry.

This event will have the effect of reversing migration patterns. Established patterns of expansion and development would be arrested, and people would seek security in the large industrial developed cities, principally in the Northeast and North Central areas of the country. The event will have serious consequences on population movement, and a -1 percent is assigned.

Event 78. Federal Funds for Community Development to Revitalize Cities Increased Three-Fold over the 1975 Level.

The cities in the Northeast and North Central regions are older and have experienced more urban decay than the rest of the country. Any major

infusion of funds for development and rehabilitation would benefit these cities more, thus making them more livable. Net out-migration from these regions due to dissatisfactions with urban life will be reduced and in-migration from the rest of the country will be encouraged by the availability of jobs. The event is seen to have a significant impact on migration patterns, and a -1 percent impact was assigned.

Event 100. Coal Production Fails to Reach Projected Levels Because of Labor Problems, Inadequate Transportation, and Environmental Constraints.

Such a fundamental failure of the coal industry will have serious consequences for the coal mining areas of the South and West. Such difficulties will increase the out-migration of workers over a moderate period of time, and a nominal impact of -0.5 percent is assumed.

```
00540   -19PERCENT POPULATION IN SOUTH AND WEST REGIONS (SCENARIO A)
00550   -2  7777 4      7  5 20     1.000 20     1.000 1
00560    04     7    PP*     809000     *     406070
00570   104     7FEDERAL GUIDELINES ARE DEVELOPED TO SERVE AS A
00580   114     7VOLUNTARY FRAMEWORK FOR PLANNING POPULATION
00590   124     7DISTRIBUTION AMONG THE VARIOUS STATES AND REGIONS.
00650   -2  7777 4     10  5 10     0.500 10     0.500 1
00670    04    10    PP*     809000     *     012035
00680   104    10NEW CITIES ARE DEVELOPED
00690   114    10PROXIMATE TO NATURAL RESOURCES.
00700   -2  7777 4     53  1  5    -1.000  5    -1.000 1
00702    04    53    PP*     809000     *     101520
00704   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00706   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00771   -2  7777 4     68  5 10     1.000 10     1.000 1
00772    04    68    PP*     809000     *     306070
00773   104    68STATES IN TEMPERATE AREAS OF THE COUNTRY OFFER
00774   114    68SIGNIFICANT TAX INCENTIVES TO ACCELERATE INTRO-
00775   124    68DUCTION OF NEW INDUSTRY.
00831   -2  7777 4     78  2  5    -1.000  5    -1.000 1
00832    04    78    PP*     809000     *     205070
00833   104    78FEDERAL FUNDS FOR COMMUNITY DEVELOPMENT, TO
00834   114    78REVITALIZE CITIES, INCREAS THREEFOLD OVER THE
00835   124    781975 LEVEL.  (COMMUNITY DEVELOPMENT FUNDS
00836   134    78TOTALLED $3.2 BILLION IN 1975).
00840   -2  7777 4     80  3  5    -0.500  5    -0.500 1
00850    04    80    PP*     809000     *     010101
00860   104    80AREAS HAVING AIR POLLUTION BELOW MAXIMUM LEGAL
00870   114    80LEVELS  ARE ALLOWED TO INCREASE
00880   124    80POLLUTION TO THESE LEVELS.
00890   -2  7777 4    100  4  8    -0.500  8    -0.500 1
00900    04   100    PP*     809000     *     105050
00910   104   100COAL PRODUCTION FAILS TO REACH PROJECTED LEVELS
00915   114   100BECAUSE OF LABOR PROBLEMS, INADEQUATE TRANSPOR-
00920   124   100TATION, AND ENVIRONMENTAL CONSTRAINTS.
00940   -2  7777 4    104  1  3    -1.000  3    -1.000 1
00941    04   104    PP*     809000     *     304050
00942   104   104RIGOROUS ENFORCEMENT OF IMMIGRATION LAWS
00943   114   104OCCURS WITH RESPECT TO ALIENS SEEKING U.S.
00944   124   104EMPLOYMENT.
00950   -2  7777 4    124  2  5     1.000  5     1.000 1
00960    04   124    PP*     809000     *     013040
00970   104   124INCREASED EXPLORATION AND DRILLING ACTIVITIES
00980   114   124DOUBLES THE RATE OF DISCOVERY OF ON- AND OFF-
00990   124   124SHORE PETROLEUM RESERVES
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Population Living in Urban Areas as a Percent of the Total Resident Population in the Combined South and West* Census Regions

BASELINE

Only decennial data from 1950 was available for this variable for which the 1970 definition of urban area was applicable. An urbanized area includes a central city or cities that qualify under one of the criteria listed below:

1a. A city of 50,000 inhabitants or more according to the 1970 census, a special census taken between 1960 and 1970, or the 1960 census provided that the city is located in an SMSA and is not included in an existing urbanized area.

1b. A city having a population of at least 25,000 which, with the addition of the population of contiguous places (incorporated or unincorporated) each of which has a population density of at least 1000 persons per square mile, and which together constitute for general economic and social purposes, a single community with a combined population of at least 50,000, provided that the city is located within an SMSA and is not included in an existing urbanized area.

2. In addition to a central city or cities, a UA includes contiguous territory meeting the following criteria:

a. Incorporated places of 2500 inhabitants or more but excluding the rural portions of extended cities.

b. Incorporated places with fewer than 2500 inhabitants, provided that each has a closely settled area of 100 housing units or more, and all unincorporated places recognized in the 1970 census.

c. Contiguous small parcels of unincorporated land determined to have a 1970 census population density of 1000 inhabitants or more per square mile. The areas of large non-residential tracts devoted to such urban land uses as railroad yards, airports, factories, parks, golf courses, and cemeteries are excluded in computing the population density.

d. Other similar small areas in unincorporated territory without regard to population density provided that they serve:

---

*Four primary census regions are referred to: (1) the South, consisting of the South Atlantic, East South Central, and West South Central states; (2) the West, consisting of the Mountain and Pacific states; (3) the Northeast, consisting of New England and the Middle Atlantic states; and (4) the North Central Division, consisting of the East North Central and West North Central states. The South and West contained 48 percent of the total U.S. population in 1970.

> to eliminate enclaves, or
> to close indentations of one mile or less in width across the open end of the urbanized areas in order to eliminate narrow fingers of "rural" areas, or
> to link outlying areas of qualifying density provided that these are not more than 1-1/2 miles from the main body of the urbanized area.[2]

The baseline projects a necessary decline in the rate of urbanization as higher percentages of urbanization are reached. The growth rate of the variable in the period to the end of the century is less than one-half the growth rate for the past 25 years. The increasing population growth in the South and West is seen as a primary factor contributing directly to the urban growth. Increased levels of affluence accompanying the expansion of commercial and industrial opportunities have accelerated shifts from the rural to urban environment.

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[2] Federal Register, Vol. 39, No. 85 (May 1, 1974), p. 15202.

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FA1012
00010      1012   1950    1970    1971    2000    1975        7       0.000     100.000
00020     0.99771183                          -2853.40          112.09
00030     1950            54.83               55.02
00040     1960            64.98               64.53
00050     1970            71.06               71.32
00060     1971             0.00               71.90
00070     1972             0.00               72.46
00080     1973             0.00               73.00
00090     1974             0.00               73.53
00100     1975             0.00               74.04
00110     1976             0.00               74.54
00120     1977             0.00               75.03
00130     1978             0.00               75.50
00140     1979             0.00               75.97
00150     1980             0.00               76.42
00160     1981             0.00               76.86
00170     1982             0.00               77.29
00180     1983             0.00               77.71
00190     1984             0.00               78.12
00200     1985             0.00               78.52
00210     1986             0.00               78.91
00220     1987             0.00               79.29
00230     1988             0.00               79.66
00240     1989             0.00               80.03
00250     1990             0.00               80.38
00260     1991             0.00               80.73
00270     1992             0.00               81.07
00280     1993             0.00               81.40
00290     1994             0.00               81.73
00300     1995             0.00               82.05
00310     1996             0.00               82.36
00320     1997             0.00               82.67
00330     1998             0.00               82.97
00340     1999             0.00               83.26
00350     2000             0.00               83.55
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

The urbanization percentage in these combined regions has been increasing at a rate of about 1 percent per year. Impacts were judged on the basis of whether their cumulative effects would be equal to, greater than, or less than a one-year's normal increase.

Event 7. Federal Guidelines Are Developed to Serve as a Voluntary Framework for Planning Population Distribution among the Various States and Regions.

This event will increase urbanization, particularly in those areas which are suffering from inadequate distribution of economic opportunity and service. Such guidelines will be used to encourage a reduction in the percentage of people living in the less viable rural environments. The effects of such policies will take place over a long period of time, but the cumulative impact will be quite large and is assumed to result in a 10 percent increase in the variable.

Event 10. New Cities Are Developed Proximate to Natural Resources.

The establishment of these cities will increase overall urbanization slightly by their added urban populations. The effect of these cities will be to also stimulate area growth. This will result in increasing the urbanization percentages because new sources of demand will have to be served from enlarged urban industrial and commercial processes. These cities will develop in a moderate period of time, and a 1 percent impact is assigned the variable.

Event 46. Environmentally Acceptable Pest Control Fails to Provide Adequate Crop Protection.

This event will produce a significant increase in the labor requirements for agriculture. Occurrence of the event will strengthen the need for rural communities which would be needed to serve the increasing demand for agricultural labor. The event will have a significant impact over the relatively few years needed to strengthen the agricultural base, and a -2 percent impact is assigned.

Event 57. $10 Billion Per Year of Government Funds Are Devoted to Urban Transit System Development (Approximately $2 Billion in 1974).

This event will have a substantial impact on urbanization patterns by encouraging the development of areas peripheral to high urban concentrations. The event is seen to reach its maximum impact over the time to develop such transit systems, and a maximum impact of 4 percent is assigned. After the transit systems are in place, some diminution of their accelerating effect on urbanization may be expected, and a steady state 2 percent impact is assumed.

Event 76. A Land-Use Bill which Requires States to Develop Federally Approved Zoning Plans is Passed.

This event will impact the rate at which outlying areas become part of the urban environment. The effect, however, is not seen to change very much the major urbanizing processes that are now going on, and a +1 percent impact is assigned.

Event 78. Federal Funds for Community Development to Revitalize Cities Increased Three-Fold over the 1975 Level.

Making the urban environment more habitable and attractive will have a positive impact on urbanization patterns. A nominal 1 percent impact is assigned this variable.

Event 89. Federal Funds Are Withheld in Order to Stop Urban Expressway Construction.

The effect of this event will make it more difficult to commute from outlying areas and will encourage movement from these areas into the city because of transportation difficulties. A nominal +1 percent impact on the variable is assumed. The maximum impact will be realized after the period of time during which transportation difficulties from the outlying areas develop.

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00360   -19URBAN POPULATION IN SOUTH AND WEST RESIONS   -  SCENARIO "A
00370   -2  7777 4       7  5 20     10.000 20     10.000 1
00380    04     7    PP*     809000     *     406070
00390   104     7FEDERAL GUIDELINES ARE DEVELOPED TO SERVE AS
00400   114     7A VOLUNTARY FRAMEWORK FOR PLANNING POPULATION
00410   124     7DISTRISUTION AMONG VARIOUS STATES AND
00420   134     7REGIONS.
00430   -2  7777 4       9  2  6      2.000  6      2.000 1
00440    04     9    PP*     809000     *     309090
00450   104     9GOVERNMENT SUBSIDIZES RELOCATION AND TRAINING
00460   114     09OF NEEDY RURAL WORKERS TO ENCOURAGE MIGRATION TO
00470   124     09URBAN CENTERS.
00480   -2  7777 4      10  5 10      1.000 10      1.000 1
00490    04    10    PP*     809000     *     012035
00500   104    10NEW CITIES ARE DEVELOPED PROXIMATE TO NATURAL
00510   114    10RESOURCES.
00520   -2  7777 4      46  3  8     -2.000  8     -2.000 1
00530    04    46    PP*     809000     *     103050
00540   104    46ENVIRONMENTALLY ACCEPTABLE PEST CONTROL FAILS TO
00550   114    46PROVIDE ADEQUATE CROP PROTECTION.
00560   -2  7777 4      57  2  6      4.000 12      2.000 1
00570    04    57    PP*     809000     *     015075
00580   104    57$10 BILLION PER YEAR OF GOVERNMENT FUNDS ARE DEVOTED
00590   114    57TO URBAN TRANSIT SYSTEM DEVELOPMENT
00600   114    57(APPROXIMATELY $2 BILLION IN 1974).
00610   -2  7777 4      72  5 10      1.000 10      1.000 1
00620    04    72    PP*     809000     *     204050
00630   104    72ANTI-EXODUS LAWS ARE PASSED PENALIZING INDUSTRY
00640   114    72FOR MOVING OUTSIDE THE UNITED STATES.
00650   -2  7777 4      76  2 10      1.000 10      1.000 1
00655    04    76    PP*     809000     *     205065
00660   104    76A LAND-USE BILL WHICH REQUIRES STATES TO
00670   114    75DEVELOP FEDERALLY APPROVED ZONING PLANS IS
00680   124    76PASSED.
00690   -2  7777 4      78  5 10      1.000 10      1.000 1
00700    04    78    PP*     809000     *     205070
00710   104    78FEDERAL FUNDS FOR COMMUNITY DEVELOPMENT, TO
00720   114    78REVITALIZE CITIES, INCREASE THREEFOLD OVER
00730   124    78THE 1975 LEVEL (COMMUNITY DEVELOPMENT FUNDS
00740   134    78TOTALLED $3.2 BILLION IN 1975).
00750   -2  7777 4      80  4 10      2.000 10      2.000 1
00760    04    80    PP*     809000     *     010101
00770   104    80AREAS HAVING AIR POLLUTION BELOW MAXIMUM LEGAL
00780   114    80LEVELS ARE ALLOWED TO INCREASE POLLUTION TO
00790   124    80THESE LEVELS.
00800   -2  7777 4      89  2  6      1.000  8      1.000 1
00810    04    89    PP*     809000     *     205070
00820   104    89FEDERAL FUNDS ARE WITHHELD IN ORDER TO STOP
00830   114    89URBAN EXPRESSWAY CONSTRUCTION.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Population Living in Urban Areas as a Percent of the Total Resident Population of Combined Northeast and North Central* Regions

BASELINE

Only decennial data from 1950 was available for this variable for which the 1970 definition of urban area was applicable. An urbanized area includes a central city or cities that qualify under one of the criteria listed below:

> 1a. A city of 50,000 inhabitants or more according to the 1970 census, a special census taken between 1960 and 1970, or the 1960 census provided that the city is located in an SMSA and is not included in an existing urbanized area.
>
> 1b. A city having a population of at least 25,000 which, with the addition of the population of contiguous places (incorporated or unincorporated) each of which has a population density of at least 1000 persons per square mile, and which together constitute for general economic and social purposes, a single community with a combined population of at least 50,000, provided that the city is located within an SMSA and is not included in an existing urbanized area.
>
> 2. In addition to a central city or cities, a UA includes contiguous territory meeting the following criteria:
>
> a. Incroporated places of 2500 inhabitants or more but excluding the rural portions of extended cities.
>
> b. Incorporated places with fewer than 2500 inhabitants, provided that each has a closely settled area of 100 housing units or more, and all unincorporated places recognized in the 1970 census.
>
> c. Contiguous small parcels of unincorporated land determined to have a 1970 census population density of 1000 inhabitants or more per square mile. The areas of large non-residential tracts devoted to such urban land uses as railroad yards, airports, factories, parks, golf courses, and cemeteries are excluded in computing the population density.
>
> d. Other similar small areas in unincorporated territory without regard to population density provided that they serve:

---

*Four primary census regions are referred to: (1) the South, consisting of the South Atlantic, East South Central, and West South Central states; (2) the West, consisting of the Mountain and Pacific states; (3) the Northeast, consisting of New England and the Middle Atlantic states; and (4) the North Central Division, consisting of the East North Central and West North Central states. The South and West contained 48 percent of the total U.S. population in 1970.

> to eliminate enclaves, or
> to close indentations of one mile or less in width across the open end of the urbanized areas in order to eliminate narrow fingers of "rural" areas, or
> to link outlying areas of qualifying density provided that these are not more than 1-1/2 miles from the main body of the urbanized area.[3]

The baseline projects a decline in the rate of urbanization over the period to the end of the century to about one-third the growth rate for the past 25 years. The urbanization growth rate is already low, however, for the Northeast and North Central regions compared with the South and West. Problems within the urban structure have tended to slow urban growth. Furthermore, the established economy of these regions has not heavily impacted existing rural-to-urban relationships.

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[3] Federal Register, Vol. 39, No. 85 (May 1, 1974), p. 15202.

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FA1011
00010      1011   1950    1970    1971    2000    1976        7       0.000      100.000
00020     0.99985042                          -763.90          86.61
00030      1950            71.32              71.33
00040      1960            73.91              73.88
00050      1970            75.68              75.70
00060      1971             0.00              75.85
00070      1972             0.00              76.00
00080      1973             0.00              76.15
00090      1974             0.00              76.29
00100      1975             0.00              76.43
00110      1976             0.00              76.56
00120      1977             0.00              76.69
00130      1978             0.00              76.82
00140      1979             0.00              76.94
00150      1980             0.00              77.06
00160      1981             0.00              77.18
00170      1982             0.00              77.29
00180      1983             0.00              77.41
00190      1984             0.00              77.52
00200      1985             0.00              77.62
00210      1986             0.00              77.73
00220      1987             0.00              77.83
00230      1988             0.00              77.93
00240      1989             0.00              78.03
00250      1990             0.00              78.12
00260      1991             0.00              78.22
00270      1992             0.00              78.31
00280      1993             0.00              78.40
00290      1994             0.00              78.49
00300      1995             0.00              78.57
00310      1996             0.00              78.65
00320      1997             0.00              78.74
00330      1998             0.00              78.82
00340      1999             0.00              78.89
00350      2000             0.00              78.97
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

The urban population, having reached high levels in these regions, has been increasing slowly during the past two decades. Some cities in these areas have, in fact, tended to lose population because of problems of crowding and urban decay. Furthermore, peripheral areas resist incorporation into the central cities and try to keep their population densities low. Because of the inability of the urban environment to readily expand, urbanization has been proceeding less rapidly than the South and West regions of the country. Impacts were judged on the basis of re-establishing urbanization patterns for the Northeast and North Central regions consistent with the rates of growth of the urban percentage currently observed in the South and West, which have been averaging approximately 1 percent per year. Impacts were judged on the basis of whether their cumulative effects would be equal to, greater than, or less than a one-year's change of the more accelerated urbanization rate found in the South and West.

Event 7. Federal Guidelines Are Developed to Serve as a Voluntary Framework for Planning Population Distribution among the Various States and Regions.

This event is seen as deliberately encouraging urbanization in order to maximize the effectiveness of the delivery of all necessary societal services. Such guidelines will establish policies whereby urbanization patterns were more evenly distributed throughout the region rather than concentrating on already overcrowded, high-density cities. Successful planning will have a significant impact in changing the level of urbanization, and an impact of 8 percent has been assumed. Since the guidelines will be voluntary, changes brought about by this event will take place over a long period of time.

Event 10. New Cities Have Developed Proximate to Natural Resources.

The development of such cities and the resulting impact on economic activity will cause an increase in migration to areas in the South and West, where such resources may be expected to be located. It is assumed that the people attracted to the South and West as a result of the development of these cities will be from urban areas in the Northeast and North Central regions, and that the impact of the migration will be to reduce the urban-to-rural ratio for the latter regions. A -1 percent impact is assigned.

Event 46. Environmentally Acceptable Pest Control Fails to Provide Adequate Crop Protection.

This event will make agriculture a more labor-intensive process and increase the demand for agricultural workers. The event will decrease urbanization levels by maintaining a need for agricultural workers and agricultural communities, and a -1 percent impact is assigned.

Event 57. $10 Billion Per Year of Government Funds Is Developed to Urban Transit System Development (Approximately $2 Billion in 1974).

The development of urban transit will make the urban environment much more attractive. Higher urban densities will be realized, and the process of urbanization will be accelerated both by the installation of the transit system and by the offering of job opportunities for its construction. The event is seen to have a significant impact on urbanization, particularly during the initial period of installation, and a 4 percent maximum impact is assumed. Realization of the maximum impact will be over the period of time that mass transit systems were being built and became an established part of the urban environment. With the transit system in place, a steady impact of 2 percent is assumed as the improved urban areas continue to be attractive.

Event 76. A Land-Use Bill which Requires States to Develop Federally Approved Zoning Plans Is Passed.

This event will maintain a balance between urban and rural areas. It will support the preservation of rural areas by limiting the haphazard encroachment of industry and commercialization. A nominal -1 percent impact is assigned. The cumulative effects of such a policy will be seen fairly slowly.

Event 78. Federal Funds for Community Development to Revitalize Cities Increase Three-Fold over the 1975 Level (Community Development Funds Total $3.2 Billion in 1975).

Implementation of this event will greatly strengthen the urban environment, making the cities both more attractive to live in and also providing job opportunities in the course of their revitalization. Maximum impact from this event will take place during the period of urban reconstruction, taken in this case to be a decade, and the maximum impact realizable from the implementation of this event is judged to be 2 percent.

Event 89. Federal Funds Are Withheld in Order to Stop Urban Expressway Construction.

The occurrence of this event will be to inhibit access to urban centers by automobile, making transportation from areas peripheral to the urban centers increasingly more difficult. The thrust of the event will be to encourage people to move into the urban environment where they could take advantage of mass transit. Such an emphasis will have a significant impact in increasing urbanization densities at the expense of decreasing populations in outlying areas, and a 2 percent impact is assumed. A reasonably long period will be necessary to change the rural-urban balance under the influence of such an event.

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00360   -19URBAN POPULATION IN N.E. AND N.C. REGIONS (SCENERIO A)
00370   -2  7777 4       7  5 20      8.000 20      8.000 1
00380    04     7    PP*     809000     *     406070
00390   104     7FEDERAL GUIDELINES APE DEVELOPED TO SERVE AS A
00400   114     7VOLUNTAPY FRAMEWORK FOR PLANNING POPULATION
00410   124     7DISTRIBUTION AMONG THE VARIOUS STATES
00420   134     7AND REGIONS.
00480   -2  7777 4       9  2  6      1.000  6      1.000 1
00490    04     9    PP*     809000     *     308090
00500   104     9GOV'T SUBSIDIZES RELOCATION AND TRAINING OF NEEDY
00510   114    09RURAL WORKERS TO ENCOURAGE MIGRATION TO URBAN CENTERS.
00520   124     9MIGRATION TO URBAN CENTERS.
00540   -2  7777 4      10  5 10     -1.000 10     -1.000 1
00550    04    10    PP*     509000     *     012035
00560   104    10NEW CITIES ARE DEVELOPED
00570   114    10PROXIMATE TO NATURAL RESOURCES.
00580   -2  7777 4      46  3  8     -1.000  8     -1.000 1
00590    04    46    PP*     809000     *     103050
00600   104    46ENVIRONMENTALLY ACCEPTABLE PEST CONTROL FAILS TO
00610   114    46PROVIDE ADEQUATE CROP PROTECTION.
00611   -2  7777 4      57  2  8      4.000 12      2.000 1
00612    04    57    PP*     809000     *     016075
00613   104    57$10 BILLION PER YEAR OF GOVERNMENT FUNDS ARE DEVOTED
00614   114    57TO URBAN TRANSIT SYSTEM DEVELOPMENT (APPROXIMATELY
00615   124    57 $2 BILLION IN 1974).
00620   -2  7777 4      72  5 10      1.000 10      1.000 1
00630    04    72    PP*     809000     *     204050
00640   104    72ANTI-EXODUS LAWS ARE PASSED PENALIZING U.S.
00650   114    72INDUSTRY FOR MOVING OUTSIDE THE U.S.
00690   -2  7777 4      76  2 10     -1.000 10     -1.000 1
00700    04    76    PP*     809000     *     205065
00710   104    76A LAND-USE BILL WHICH REQUIRES STATES
00711   114    76TO DEVELOP FEDERALLY APPROVED ZONING PLANS IS PASSED.
00720   -2  7777 4      78  5 10      2.000 10      2.000 1
00730    04    78    PP*     809000     *     205070
00740   104    78FEDERAL FUNDS FOR COMMUNITY DEVELOPEMENT, TO REVITA-
00750   114    78LIZE CITIES, INCREASE THREEFOLD OVER THE 1975 LEVEL.
00760   124    78(DEVELOPMENT FUNDS TOTALLED $3.2 BILLION IN 1975).
00780   -2  7777 4      80  4 10     -1.000 10     -1.000 1
00790    04    80    PP*     809000     *     010101
00800   104    80AREAS HAVING AIR POLLUTION BELOW MAXIMUM LEGAL
00810   114    80LEVELS ARE ALLOWED TO INCREASE AIR POLLUTION
00820   124    80TO THESE LEVELS.
00830   -2  7777 4      89  2  8      2.000  8      2.000 1
00840    04    89    PP*     809000     *     205070
00855   104    89FEDERAL FUNDS ARE WITHHELD IN ORDER TO STOP URBAN
00866   114    89EXPRESSWAY CONSTRUCTION.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Gross National Product (GNP)

GNP, together with population, was chosen to be a prime differentiator among the scenarios. In assessing the potential values of this variable the major requirement was that the two extremes chosen should provide reasonable boundaries to delineate the scenario space. Within that space there was also a need to choose values which would also be representative within the total spectrum.

A number of key factors were examined in deciding what GNP growth rates to assign to each scenario. The factors considered were population, energy costs, productivity, capital formation, government's role, and social attitudes toward growth. In Table 2 the qualitative aspects of these factors are shown. Through consideration of these factors and with reference to historical growth rates of GNP the growth rates were chosen. Since this is an intuitive exercise the specific rates chosen are somewhat arbitrary. It should be emphasized that the rates were chosen to bound the scenario space and to provide a description of the spectrum within that space.

Table 2

FACTORS EXAMINED IN ASSIGNING GROSS NATIONAL PRODUCT GROWTH RATES

Characteristic	Scenario A Limited Growth	B Expansive Growth	C Individual Affluence	D Hardship	R Resource Allocation
Population	Low	High	Low	High	Low
Productivity	Low	High	High	Low	Moderate
Capital Formation	Low	High	High	Low	Moderate
Governmental Role and Presence	Substantial	Small	Substantial	Ineffective	Substantial
Social Attitudes Toward Growth	Conscious Low Growth	Laissez-Faire High Growth	High Growth Central-Direction	Desirable But not Attainable	Moderate Planned Growth

The growth rates were

	Scenario				
Year	A	B	C	D	R
1976	5.0	5.0	5.0	5.0	5.0
1977	4.2	6.2	6.2	4.2	6.2
1978	3.2	4.8	4.8	3.2	4.4
1979	2.9	4.7	4.7	2.6	3.8
1980	2.6	4.6	4.6	2.6	3.8
1981	2.2	4.4	4.3	2.6	3.8
1982	2.1	4.4	4.3	2.5	3.5
1983	2.0	4.4	4.3	2.4	3.5
1984	1.8	4.4	4.3	2.2	3.5
1985	1.4	4.4	4.3	1.8	3.5
1986	1.3	4.8	4.6	1.6	3.3
1987	1.1	4.8	4.6	1.5	3.3
1988	1.0	4.8	4.6	1.5	3.3
1989	1.0	5.0	4.8	1.5	3.3
1990	1.0	5.0	4.8	1.5	3.0
1991	1.0	5.0	4.8	1.5	3.0
1992	1.0	5.2	5.0	1.5	3.0
1993	1.0	5.2	5.0	1.5	3.0
1994	1.0	5.2	5.0	1.4	3.0
1995	0.8	5.2	5.0	1.3	3.0
1996	0.8	5.2	5.0	1.3	3.0
1997	0.8	5.2	5.0	1.3	3.0
1998	0.8	5.2	5.0	1.2	3.0
1999	0.8	5.2	5.0	1.2	3.0
2000	0.8	5.2	5.0	1.2	3.0

Gross National Product Per Capita (Constant 1975 Dollars)

Projected values for GNP per capita were computed by dividing the projections of GNP for each year by the population projection for the same year.

Disposable Personal Income (DPI) Per Capita

Personal Consumption Expenditures (PCE)

The behavior of these two variables was felt to be so closely related to GNP that their baseline projections could be meaningfully derived from the GNP projections. Scenario-dependent baselines for each were obtained by relating them to GNP through developed regression equations.

In the regression analysis data points were taken from 1947 to 1975. The specific scenario projections were obtained by relating them to GNP via regression analysis. The correlation coefficient between GNP and DPI was 0.996 and between GNP and PCE was 0.996 which implies a very close relationship. Figures 1 and 2 show the lines connecting the points on two scatter diagrams. Figure 1 shows the relationship between GNP and DPI, while Figure 2 shows the relationship between GNP and PCE.

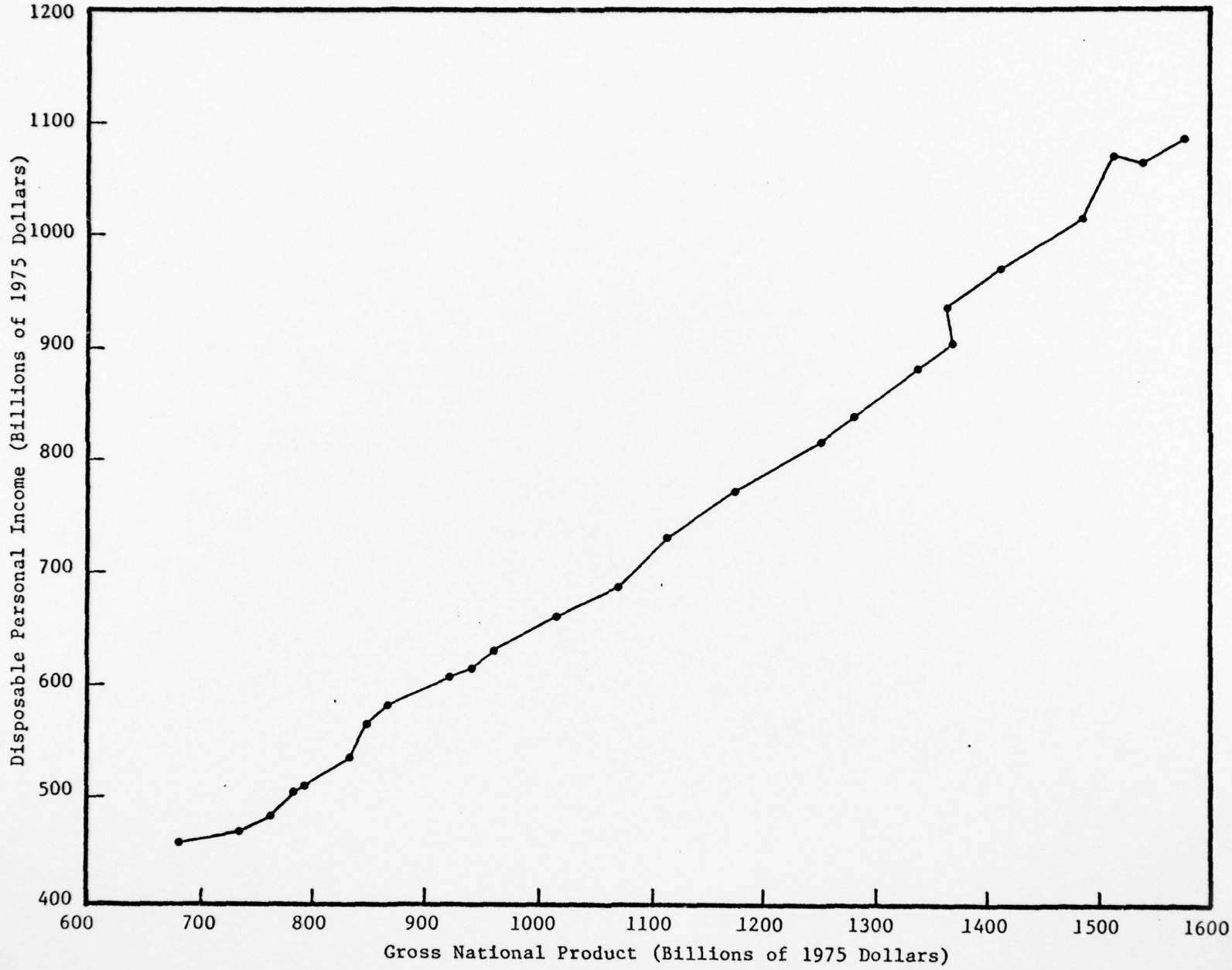

Figure 1. Relationship of disposable personal income to gross national product

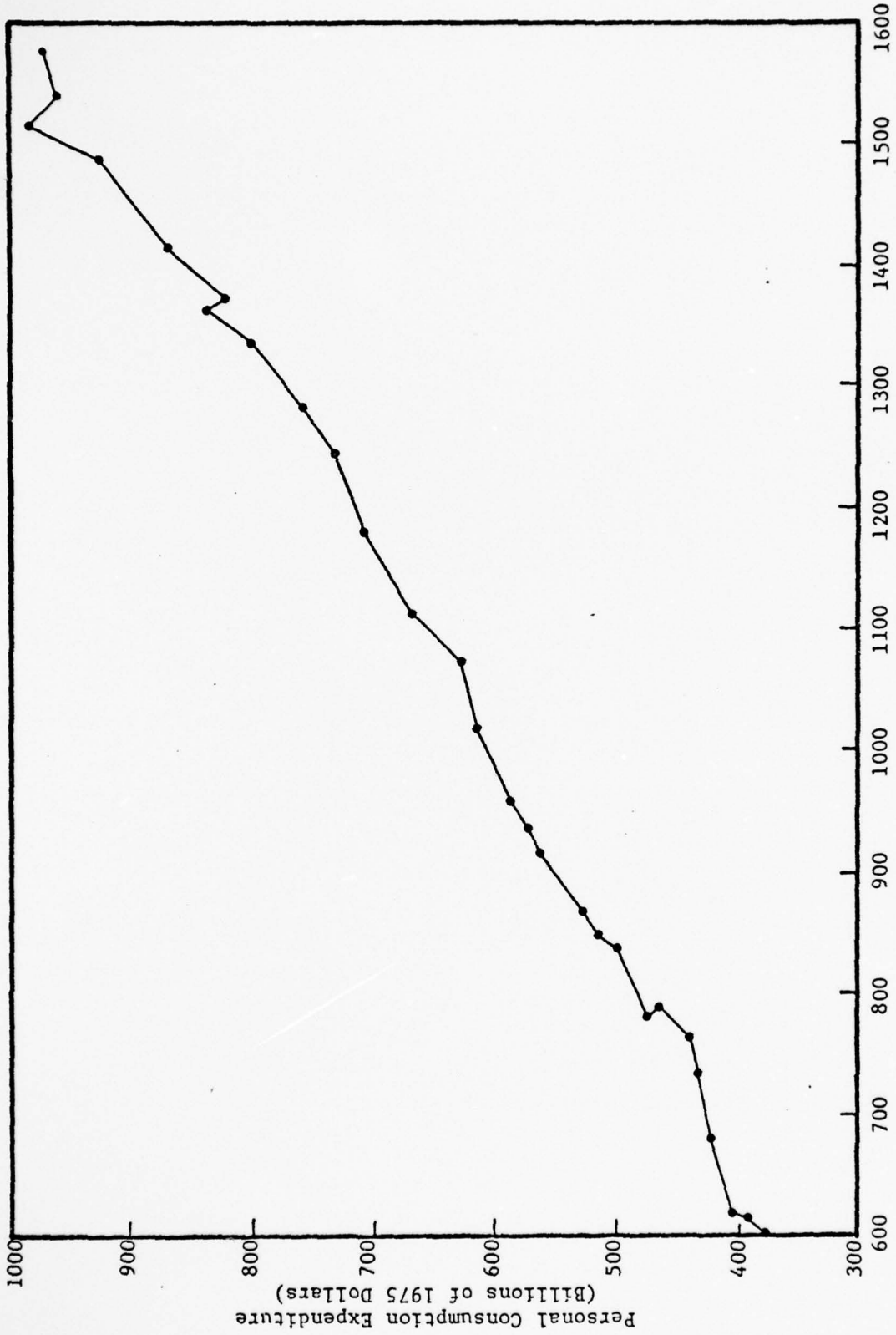

Figure 2. Relation of personal consumption expenditures to gross national product

The equations are shown below.

DPI

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y) DPI
INDEPENDENT VARIABLE (X) GNP

NUMBER OF OBSERVATIONS 28
DETERMINAT OF THE INVERSE MATRIX 1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.9961	.68607	.11937E-01	57.472

REGRESSION INTERCEPT	-226.61
MULTIPLE CORRELATION	.99609
STD. ERROR OF ESTIMATE	187.08
COEFF OF DETERMINATION	.99219

ANALYSIS OF VARIANCE FOR 1 DEGREE POLYNOMIAL

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	IMP IN TERMS OF SUM OF SQS
DUE TO REGRESSION	1	1.1561E+08	1.1561E+08	3.3031E+03	1.1561E+08
DEV. ABOUT REGRESSION	26	9.1000E+05	3.5000E+04		
TOTAL	27	1.1652E+08			

PCE

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y)	PCE
INDEPENDENT VARIABLE (X)	GNP
NUMBER OF OBSERVATIONS	28
DETERMINAT OF THE INVERSE MATRIX	1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.9968	.60932	.95790E-02	63.609

REGRESSION INTERCEPT	-14.941
MULTIPLE CORRELATION	.99680
STD. ERROR OF ESTIMATE	150.12
COEFF OF DETERMINATION	.99362

ANALYSIS OF VARIANCE FOR 1 DEGREE POLYNOMIAL

SOURCE OF VARIATION	DEGREE OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F VALUE	IMP IN TERM OF SUM OF SQ
DUE TO REGRESSION	1	9.1189E+07	9.1189E+07	4.0462E+03	9.1189E+07
DEV. ABOUT REGRESSION	26	5.8597E+05	2.2537E+04		
TOTAL	27	9.1775E+07			

With these regressions in hand the specific values of GNP in each scenario were put into the equations and projected to the year 2000.

Index of Industrial Production

BASELINE

The growth rates of GNP assumed for each of the scenarios characterize the economic growth experienced within the scenarios over the long term (i.e., 1976-2000). Given the fact that between the highest and lowest growth rates there is a considerable difference, it was decided to "key" the baselines of the index of industrial production to those assumed growth rates. In essence, the tone and the structure of each scenario (and the differences between scenarios) necessitated the use of separate baselines. If one posed the question (as the study team did), "Why does industrial production differ among scenarios?" the most basic and fundamental answer is that the growth and pace of economic activity in each scenario was quite different.

The "keying" of the baselines was achieved by estimating a regression equation of the form Industrial Production = f(GNP) from 1947 through 1975. The equation had an $\overline{R}^2$ of 0.995. Once this equation was derived the assumed value of GNP in each scenario was "plugged into" the equation and projected out to the year 2000. This projection yielded the five baselines for industrial production which were used in the TIA analysis.

Regression Equation

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y) TIP
INDEPENDENT VARIABLE (X) GNP

NUMBER OF OBSERVATIONS 28
DETERMINAT OF THE INVERSE MATRIX 1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.9974	.90725E-02	.12908E-03	70.286

REGRESSION INTERCEPT -17.676
MULTIPLE CORRELATION .99738
STD. ERROR OF ESTIMATE 2.0230
COEFF OF DETERMINATION .99476

```
FA1082
00010      1082   1950   1975   1976   2000   1976        9       0.000      600.000
00020   0.96993299                          0.60          -0.80
00030   1950          44.90          45.11
00040   1951          48.70          47.21
00050   1952          50.60          49.39
00060   1953          54.80          51.66
00070   1954          51.90          54.01
00080   1955          58.50          56.45
00090   1956          61.10          58.98
00100   1957          61.90          61.61
00110   1958          57.90          64.33
00120   1959          64.80          67.15
00130   1960          66.20          70.08
00140   1961          66.70          73.12
00150   1962          72.20          76.26
00160   1963          76.50          79.52
00170   1964          81.70          82.89
00180   1965          89.20          86.39
00190   1966          97.90          90.01
00200   1967         100.00          93.76
00210   1968         105.70          97.64
00220   1969         110.70         101.66
00230   1970         106.60         105.82
00240   1971         106.50         110.13
00250   1972         115.20         114.58
00260   1973         125.60         119.19
00270   1974         124.80         123.95
00280   1975         113.90         128.88
00290   1976           0.00         126.76
00300   1977           0.00         132.04
00310   1978           0.00         137.65
00320   1979           0.00         143.18
00330   1980           0.00         145.26
00340   1981           0.00         149.89
00350   1982           0.00         153.43
00360   1983           0.00         156.79
00370   1984           0.00         159.96
00380   1985           0.00         162.50
00390   1986           0.00         164.86
00400   1987           0.00         166.86
00410   1988           0.00         168.67
00420   1989           0.00         170.58
00430   1990           0.00         172.39
00440   1991           0.00         174.30
00450   1992           0.00         176.29
00460   1993           0.00         179.20
00470   1994           0.00         180.20
00480   1995           0.00         181.74
00490   1996           0.00         183.37
00500   1997           0.00         184.91
00510   1998           0.00         186.55
00520   1999           0.00         188.15
00530   2000           0.00         189.81
```

Baseline Scenario A (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA2082
00010      1082   1950   1975   1976   2000   1975        9       0.000      600.000
00020  0.99993299                          0.60          -0.80
00030  1950            44.90           45.11
00040  1951            48.70           47.21
00050  1952            50.60           49.39
00060  1953            54.80           51.66
00070  1954            51.90           54.01
00080  1955            56.50           56.45
00090  1956            61.10           58.98
00100  1957            61.90           61.61
00110  1958            57.90           64.33
00120  1959            64.60           67.15
00130  1960            66.20           70.06
00140  1961            66.70           73.12
00150  1962            72.20           76.26
00160  1963            76.50           79.52
00170  1964            81.70           82.89
00180  1965            89.20           86.39
00190  1966            97.90           90.01
00200  1967           100.00           93.76
00210  1968           105.70           97.64
00220  1969           110.70          101.66
00230  1970           106.50          105.82
00240  1971           106.80          110.12
00250  1972           115.20          114.58
00260  1973           125.60          119.19
00270  1974           124.80          123.95
00280  1975           113.80          128.88
00290  1976             0.00          126.76
00300  1977             0.00          135.74
00310  1978             0.00          143.09
00320  1979             0.00          150.62
00330  1980             0.00          158.42
00340  1981             0.00          166.13
00350  1982             0.00          174.21
00360  1983             0.00          182.64
00370  1984             0.00          191.44
00380  1985             0.00          200.70
00390  1986             0.00          211.13
00400  1987             0.00          222.11
00410  1988             0.00          233.63
00420  1989             0.00          246.24
00430  1990             0.00          259.40
00440  1991             0.00          273.28
00450  1992             0.00          288.43
00460  1993             0.00          304.31
00470  1994             0.00          321.09
00480  1995             0.00          338.69
00490  1996             0.00          357.20
00500  1997             0.00          376.71
00510  1998             0.00          397.21
00520  1999             0.00          418.6
00530  2000             0.00          441.48
```

Baseline Scenario B (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA3082
00010      1082   1950   1975   1976   2000   1975        9       0.000     600.000
00020    0.96993299                          0.50          -0.50
00030      1950          44.90          45.11
00040      1951          48.70          47.21
00050      1952          50.60          49.39
00060      1953          54.80          51.56
00070      1954          51.90          54.01
00080      1955          58.50          56.45
00090      1956          61.10          58.98
00100      1957          61.90          61.61
00110      1958          57.90          64.33
00120      1959          64.80          67.15
00130      1960          66.20          70.08
00140      1961          66.70          73.12
00150      1962          72.20          76.26
00160      1963          76.50          79.52
00170      1964          81.70          82.89
00180      1965          89.20          86.39
00190      1966          97.90          90.01
00200      1967         100.00          93.76
00210      1968         105.70          97.54
00220      1969         110.70         101.56
00230      1970         106.60         105.82
00240      1971         106.80         110.12
00250      1972         115.20         114.58
00260      1973         125.60         119.19
00270      1974         124.80         123.95
00280      1975         113.80         128.88
00290      1976           0.00         125.76
00300      1977           0.00         135.74
00310      1978           0.00         143.09
00320      1979           0.00         150.62
00330      1980           0.00         158.42
00340      1981           0.00         165.95
00350      1982           0.00         173.84
00360      1983           0.00         182.01
00370      1984           0.00         190.72
00380      1985           0.00         199.61
00390      1986           0.00         209.59
00400      1987           0.00         202.11
00410      1988           0.00         231.00
00420      1989           0.00         242.98
00430      1990           0.00         255.50
00440      1991           0.00         268.56
00450      1992           0.00         282.90
00460      1993           0.00         297.96
00470      1994           0.00         313.65
00480      1995           0.00         330.25
00490      1996           0.00         347.57
00500      1997           0.00         365.91
00510      1998           0.00         385.14
00520      1999           0.00         405.28
00530      2000           0.00         426.42
```

Baseline Scenario C (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA4082
00010      1092   1950    1975    1976    2000    1976        9        0.000      600.000
00020  0.96993299                                    0.60        -0.80
00030      1950           44.90           45.11
00040      1951           48.70           47.21
00050      1952           50.60           49.39
00060      1953           54.80           51.56
00070      1954           51.90           54.01
00080      1955           58.50           56.45
00090      1956           61.10           58.98
00100      1957           61.90           61.61
00110      1958           57.90           64.33
00120      1959           64.80           67.15
00130      1960           66.20           70.08
00140      1961           66.70           73.12
00150      1962           72.20           76.26
00160      1963           76.50           79.52
00170      1964           81.70           82.89
00180      1965           89.20           86.39
00190      1966           97.90           90.01
00200      1967          100.00           93.76
00210      1968          105.70           97.64
00220      1969          110.70          101.66
00230      1970          106.60          105.82
00240      1971          106.80          110.12
00250      1972          115.20          114.58
00260      1973          125.60          119.19
00270      1974          124.80          123.95
00280      1975          113.80          128.88
00290      1976            0.00          126.76
00300      1977            0.00          132.84
00310      1978            0.00          137.65
00320      1979            0.00          141.64
00330      1980            0.00          145.81
00340      1981            0.00          150.07
00350      1982            0.00          154.25
00360      1983            0.00          158.33
00370      1984            0.00          162.23
00380      1985            0.00          165.50
00390      1986            0.00          168.40
00400      1987            0.00          171.21
00410      1988            0.00          174.12
00420      1989            0.00          176.93
00430      1990            0.00          179.83
00440      1991            0.00          182.83
00450      1992            0.00          185.82
00460      1993            0.00          188.90
00470      1994            0.00          191.81
00480      1995            0.00          194.53
00490      1996            0.00          197.25
00500      1997            0.00          200.06
00510      1998            0.00          202.59
00520      1999            0.00          205.23
00530      2000            0.00          207.96
```

Baseline Scenario D (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
*A5082
00010    1092   1950   1975   1976   2000   1976       9      0.000     600.000
00020 0.96893299                          0.60          -0.80
00030    1950          44.90          45.11
00040    1951          48.70          47.21
00050    1952          50.60          49.39
00060    1953          54.80          51.66
00070    1954          51.90          54.01
00080    1955          58.50          56.45
00090    1956          61.10          58.98
00100    1957          61.90          61.61
00110    1958          57.90          64.33
00120    1959          64.80          67.15
00130    1960          66.20          70.08
00140    1961          66.70          73.12
00150    1962          72.20          76.26
00160    1963          76.50          79.52
00170    1964          81.70          82.89
00180    1965          89.20          86.39
00190    1966          97.90          90.01
00200    1967         100.00          93.76
00210    1968         105.70          97.64
00220    1969         110.70         101.66
00230    1970         106.60         105.82
00240    1971         105.80         110.12
00250    1972         115.20         114.58
00260    1973         125.60         119.19
00270    1974         124.30         123.95
00280    1975         113.80         128.88
00290    1976           0.00         126.77
00300    1977           0.00         135.72
00310    1978           0.00         142.45
00320    1979           0.00         148.53
00330    1980           0.00         155.52
00340    1981           0.00         162.05
00350    1982           0.00         168.40
00360    1983           0.00         174.94
00370    1984           0.00         181.65
00380    1985           0.00         188.63
00390    1986           0.00         195.44
00400    1987           0.00         202.42
00410    1988           0.00         209.77
00420    1989           0.00         217.30
00430    1990           0.00         224.29
00440    1991           0.00         231.55
00450    1992           0.00         239.08
00460    1993           0.00         246.79
00470    1994           0.00         254.68
00480    1995           0.00         262.85
00490    1996           0.00         271.28
00500    1997           0.00         279.90
00510    1998           0.00         288.88
00520    1999           0.00         298.05
00530    2000           0.00         307.48
```

Baseline Scenario R (index [1967 = 100])

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

It is assumed that the cartels formed will do one or both of two things: the first action would be to raise prices; the second would be to reduce or to stop supplies which then would lead to a price increase. In either case, the rate of inflation will be boosted. If supplies were curtailed, serious bottlenecks could lead to decreases in production or to the use of expensive substitute materials. In either case, the impact would be negative and was estimated at 2 percent.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

A 10 percent capital shortage is assumed for this event. A regression equation of the form Industrial Production = f(capital spending) was derived. Capital spending was reduced by 10 percent in 1975, 1974, and 1965, and the average decrease in industrial production was 11 percent. Since, however, the shortage refers to long-term external investment funds which accounted for a bit more than one-half of all funds raised, the impact was reduced to 5 percent, and this was used in the TIA analysis.

Event 55. Wage, Price, Profit, and Interest Rate Control Are Permanently Established.

It is assumed that the controls which are imposed "work" (i.e., that inflation is significantly reduced). Since these controls remove the threat of inflation the economy should begin to function properly (i.e., without the distortions caused by increasing prices). "Real output" would increase. It was assumed that real GNP would increase by $22 billion. This estimate was inserted into a regression equation of the form Industrial Production = f(GNP). The estimate using this equation showed a 1.6 percent increase in industrial production, and this was the impact used in the TIA analysis.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

Firms were assumed to increase their outlays on capital expenditures for new plant and equipment by 20 percent of the decrease in tax. This increase in capital spending was estimated to result in a 0.9 percent increase in industrial production. This result was obtained by estimating the increase in GNP caused by the increase in spending and then calculating the corresponding increase in industrial production utilizing an equation which related industrial production to GNP.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget is Balanced on an Expenditure Basis.

This new stance by the Federal Reserve System would most likely decrease somewhat the cyclical behavior of the domestic economy. This, plus the fact that policies of the Federal Reserve are known and can be counted on to reinforce the economy, would lead to a reduction in uncertainty throughout the private sector. In addition, the balanced budget implies a smaller government presence in the credit market, and this should free up needed capital for industry. The impact was estimated at a 2 percent increase.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

It was assumed that U.S. exports to these countries would fall by 70 percent and in turn that U.S. imports from these same countries would fall by 30 percent. This would add to our trade deficit and reduce GNP by approximately 1.7 percent. This would in turn reduce industrial production by 2.5 percent. This estimate was obtained by using the regression equation which related industrial production to GNP.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

Firms were assumed to increase their outlays for capital spending on new plant and equipment due to the increase in depreciation allowances. Utilizing a regression equation which related industrial production to capital spending, the average impact calculated from figures covering 1972-1975 was approximately a 3 percent increase. This 3 percent increase was used in the TIA analysis.

```
00540   -1 INDEX OF INDUSTRIAL PRODUCTION A
00550   -2  7777 4      51  1  4     -2.000  6     -1.000 1
00560    04     51     PP*     809000     *     257090
00570   104     51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00580   114     51MATERIALS: BAUXITE, MANGANESE, TIN AND
00590   124     51CHROMIUM.
00620   -2  7777 4      53  3  5     -5.000 15     -3.000 1
00630    04     53     PP*     809000     *     101320
00640   104     53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00650   114     53TERM INVESTMENT NEEDS OF INDUSTRY.
00680   -2  7777 4      55  1  2      1.600  5      1.000 1
00690    04     55     PP*     809000     *     308095
00700   104     55WAGE, PRICE, PROFIT AND INTEREST CONTROLS
00710   114     55ARE PERMANENTLY ESTABLISHED.
00720   -2  7777 4      73  1  3      2.800  6      1.500 1
00730    04     73     PP*     809000     *     104050
00740   104     73LEGISLATION PROVIDING A GUARANTEED MINIMUM
00750   114     73ANNUAL INCOME FOR U.S. CITIZENS.
00760   -2  7777 4     151  2  4      0.900  8      0.400 1
00770    04    151     PP*     809000     *     010101
00780   104    151CORPORATE INCOME TAX RATE IS REDUCED BY 50
00784   114    151PERCENT FROM 1975 LEVELS.
00790   -2  7777 4     152  1  2      2.000  7      1.000 1
00800    04    152     PP*     809000     *     010101
00810   104    152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00814   114    152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00818   124    152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00822   134    152 MONETARY POLICY AS A DISCRETIONARY TOOL,
00826   144    152AND THE FEDERAL BUDGET IS BALANCED.
00830   -2  7777 4     182  1  3      3.000  5      1.000 1
00840    04    182     PP*     809000     *     010510
00850   104    172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00854   114    172TRADE AND INVESTMENT RESTRICTIONS WHICH EFFEC-
00858   124    172TIVELY DENY MARKET ACCESS TO THE U.S.
00870   -2  7777 4     183  1  2     -2.500  3     -0.500 1
00880    04    183     PP*     809000     *     606060
00890   104    183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%
00895   114    183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
00900   -2  7777 4     186  2  4      1.300  7      0.500 1
00910    04    186     PP*     809000     *     011520
00920   104    186THE STOCK OF CAPITAL PER WORKER AVERAGES 25% GROWTH
00930   114    186FOR A TEN-YEAR PERIOD.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Output Per Hour of All Persons in the Private Non-Farm Business Sector

BASELINE

The baselines for this productivity indicator were obtained by putting assumed GNP values for each scenario into a regression equation derived from historical data. The equation, productivity = f(GNP), had an $\overline{R}^2$ of 0.985. The five baselines were then used in the TIA analysis to obtain the final projections.

Regression Equation

```
SPX:>LERS PRO GNP

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y)                PRO
INDEPENDENT VARIABLE (X)              GNP

NUMBER OF OBSERVATIONS                  28
DETERMINAT OF THE INVERSE MATRIX     1.000E+00

POLYNOMIAL REGRESSION OF DEGREE  1

POLYNOMIAL      CORRELATION     REGRESSION      STD.ERROR       COMPUTED
DEGREE IN X       X VS Y        COEFFICIENT     OF REG.COEF     T VALUE

   1              0.9928         .63698E-02      .15074E-03      42.258

REGRESSION INTERCEPT              16.828
MULTIPLE CORRELATION              .99280
STD. ERROR OF ESTIMATE            2.3623
COEFF OF DETERMINATION            .98565
```

```
FA1080
00010      1080   1950   1975   1976   2000   1976        6        0.000     300.000
00020  0.98939235                                1.26        -0.01
00030      1950          59.70          59.69
00040      1951          61.30          61.50
00050      1952          63.20          63.34
00060      1953          65.50          65.23
00070      1954          66.70          67.15
00080      1955          69.30          69.12
00090      1956          70.20          71.12
00100      1957          72.10          73.17
00110      1958          74.50          75.27
00120      1959          77.20          77.41
00130      1960          78.40          79.60
00140      1961          81.00          81.84
00150      1962          84.30          84.13
00160      1963          87.50          86.47
00170      1964          91.40          88.86
00180      1965          94.50          91.32
00190      1966          97.60          93.83
00200      1967         100.00          96.40
00210      1968         103.20          99.03
00220      1969         103.40         101.73
00230      1970         104.20         104.50
00240      1971         107.60         107.34
00250      1972         110.90         110.25
00260      1973         113.00         113.23
00270      1974         109.20         116.30
00280      1975         110.20         119.45
00290      1976           0.00         118.23
00300      1977           0.00         122.50
00310      1978           0.00         125.88
00320      1979           0.00         129.06
00330      1980           0.00         131.93
00340      1981           0.00         134.48
00350      1982           0.00         136.96
00360      1983           0.00         139.32
00370      1984           0.00         141.55
00380      1985           0.00         143.33
00390      1986           0.00         144.99
00400      1987           0.00         146.39
00410      1988           0.00         147.66
00420      1989           0.00         149.00
00430      1990           0.00         150.27
00440      1991           0.00         151.61
00450      1992           0.00         153.01
00460      1993           0.00         154.35
00470      1994           0.00         155.75
00480      1995           0.00         156.84
00490      1996           0.00         157.98
00500      1997           0.00         159.07
00510      1998           0.00         160.21
00520      1999           0.00         161.36
00530      2000           0.00         162.50
```

Baseline Scenario A (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA2080
00010      1080    1950    1975    1976    2000    1976        6       0.000     300.000
00020    0.98939235                                  1.26        -0.01
00030    1950          59.70          59.69
00040    1951          61.30          61.50
00050    1952          63.20          63.34
00060    1953          65.50          65.23
00070    1954          66.70          67.15
00080    1955          69.30          69.12
00090    1956          70.20          71.12
00100    1957          72.10          73.17
00110    1958          74.50          75.27
00120    1959          77.20          77.41
00130    1960          78.40          79.60
00140    1961          81.00          81.84
00150    1962          84.30          84.13
00160    1963          87.50          86.47
00170    1964          91.40          88.86
00180    1965          94.50          91.32
00190    1966          97.60          93.83
00200    1967         100.00          96.40
00210    1968         103.20          99.03
00220    1969         103.40         101.73
00230    1970         104.20         104.50
00240    1971         107.50         107.34
00250    1972         110.90         110.25
00260    1973         113.00         113.23
00270    1974         109.20         116.30
00280    1975         110.20         119.45
00290    1976           0.00         118.23
00300    1977           0.00         124.54
00310    1978           0.00         129.70
00320    1979           0.00         134.99
00330    1980           0.00         140.47
00340    1981           0.00         145.88
00350    1982           0.00         151.55
00360    1983           0.00         157.47
00370    1984           0.00         163.65
00380    1985           0.00         170.15
00390    1986           0.00         177.47
00400    1987           0.00         185.18
00410    1988           0.00         193.27
00420    1989           0.00         202.13
00430    1990           0.00         211.36
00440    1991           0.00         221.11
00450    1992           0.00         231.74
00460    1993           0.00         242.89
00470    1994           0.00         254.68
```

Baseline Scenario B (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA3080
00010     1080   1950   1975   1976   2000   1976      6      0.000     300.000
00020  0.98939235                              1.26      -0.01
00030  1950          59.70          59.69
00040  1951          61.30          61.50
00050  1952          63.20          63.34
00060  1953          65.50          65.23
00070  1954          66.70          67.15
00080  1955          69.30          69.12
00090  1956          70.20          71.12
00100  1957          72.10          73.17
00110  1958          74.50          75.27
00120  1959          77.20          77.41
00130  1960          78.40          79.60
00140  1961          81.00          81.84
00150  1962          84.30          84.13
00160  1963          87.50          86.47
00170  1964          91.40          88.86
00180  1965          94.50          91.32
00190  1966          97.60          93.83
00200  1967         100.00          96.40
00210  1968         103.20          99.03
00220  1969         103.40         101.73
00230  1970         104.20         104.50
00240  1971         107.60         107.34
00250  1972         110.90         110.25
00260  1973         113.00         113.23
00270  1974         109.20         116.30
00280  1975         110.20         119.45
00290  1976           0.00         118.23
00300  1977           0.00         124.54
00310  1978           0.00         129.70
00320  1979           0.00         134.99
00330  1980           0.00         140.47
00340  1981           0.00         145.75
00350  1982           0.00         151.29
00360  1983           0.00         157.03
00370  1984           0.00         163.14
00380  1985           0.00         169.38
00390  1986           0.00         175.39
00400  1987           0.00         183.78
00410  1988           0.00         191.42
00420  1989           0.00         199.83
00430  1990           0.00         208.62
00440  1991           0.00         217.79
00450  1992           0.00         227.86
00460  1993           0.00         238.43
00470  1994           0.00         249.45
00480  1995           0.00         261.11
00490  1996           0.00         273.34
00500  1997           0.00         286.14
00510  1998           0.00         299.65
00520  1999           0.00         313.79
00530  2000           0.00         328.63
```

Baseline Scenario C (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA4080
00010     1080   1950    1975   1976    2000   1976       6       0.000     300.000
00020  0.98939235                                  1.25       -0.01
00030     1950          59.70          59.69
00040     1951          61.30          61.50
00050     1952          63.20          63.34
00060     1953          65.50          65.23
00070     1954          66.70          67.15
00080     1955          69.30          69.12
00090     1956          70.20          71.12
00100     1957          72.10          73.17
00110     1958          74.50          75.27
00120     1959          77.20          77.41
00130     1960          78.40          79.60
00140     1961          81.00          81.94
00150     1962          84.30          84.13
00160     1963          87.50          86.47
00170     1964          91.40          88.86
00180     1965          94.50          91.32
00190     1966          97.60          93.83
00200     1967         100.00          96.40
00210     1968         103.20          99.03
00220     1969         103.40         101.73
00230     1970         104.20         104.50
00240     1971         107.60         107.34
00250     1972         110.90         110.25
00260     1973         113.00         113.23
00270     1974         109.20         116.30
00280     1975         110.20         119.45
00290     1976           0.00         118.23
00300     1977           0.00         122.50
00310     1978           0.00         125.88
00320     1979           0.00         128.68
00330     1980           0.00         131.61
00340     1981           0.00         134.61
00350     1982           0.00         137.54
00360     1983           0.00         140.40
00370     1984           0.00         143.14
00380     1985           0.00         145.43
00390     1986           0.00         147.47
00400     1987           0.00         149.45
00410     1988           0.00         151.49
00420     1989           0.00         153.46
00430     1990           0.00         155.50
00440     1991           0.00         157.60
00450     1992           0.00         159.70
00460     1993           0.00         161.87
00470     1994           0.00         163.91
00480     1995           0.00         165.82
00490     1996           0.00         167.73
00500     1997           0.00         169.70
00510     1998           0.00         171.55
00520     1999           0.00         173.40
00530     2000           0.00         175.24
```


Baseline Scenario D (index [1967 = 100])

(See p. 2.4 for key to the data.)

```
FA5080
00010     1950   1950   1975   1976   2000   1976        6      0.000     300.000
00020  0.98939235                          1.26          -0.01
00030     1950          59.70          59.69
00040     1951          61.30          61.50
00050     1952          63.20          63.34
00060     1953          65.50          65.23
00070     1954          66.70          67.15
00080     1955          69.30          69.12
00090     1956          70.20          71.12
00100     1957          72.10          73.17
00110     1958          74.50          75.27
00120     1959          77.20          77.41
00130     1960          78.40          79.60
00140     1961          81.00          81.84
00150     1962          84.30          84.13
00160     1963          87.50          86.47
00170     1964          91.40          88.86
00180     1965          94.50          91.32
00190     1966          97.60          93.83
00200     1967         100.00          96.40
00210     1968         103.20          99.03
00220     1969         103.40         101.73
00230     1970         104.20         104.50
00240     1971         107.60         107.34
00250     1972         110.90         110.25
00260     1973         113.00         113.23
00270     1974         109.20         116.30
00280     1975         110.20         119.45
00290     1976           0.00         118.24
00300     1977           0.00         124.53
00310     1978           0.00         129.25
00320     1979           0.00         133.52
00330     1980           0.00         138.43
00340     1981           0.00         143.01
00350     1982           0.00         147.47
00360     1983           0.00         151.99
00370     1984           0.00         156.77
00380     1985           0.00         161.68
00390     1986           0.00         166.45
00400     1987           0.00         171.36
00410     1988           0.00         176.52
00420     1989           0.00         181.81
00430     1990           0.00         186.71
00440     1991           0.00         191.81
00450     1992           0.00         197.09
00460     1993           0.00         202.51
00470     1994           0.00         208.05
00480     1995           0.00         213.78
00490     1996           0.00         219.71
00500     1997           0.00         225.76
00510     1998           0.00         232.06
00520     1999           0.00         238.50
00530     2000           0.00         245.12
```


Baseline Scenario R (index [1967 = 100])

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 11. Use of Telecommunications Reduces the Amount of All Travel by 20 Percent.

It was assumed that the occurrence of this event would decrease the amount of work time which is spent in traveling. Also it was assumed that workers would spend less time readjusting to work routines after traveling. It was assumed that travel takes up approximately 5 percent of all work time. For example, if a worker now spends 40 hours per week on the job, 2 hours of that time was assumed to represent travel. If this time was reduced 20 percent, a worker would produce the same output in 39.6 hours. This implies a 1 percent increase in output per hour. It was assumed that 40 percent of all workers would be affected so the total impact for the entire nonfarm private business sector would be a 0.4 percent increase.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

A 10 percent capital shortage was assumed. A regression equation of the form, $\text{productivity} = f(\text{capital spending}_{t-1})$, was estimated (the equation had an $\bar{R}^2$ of 0.89). For 1974, 1970, and 1966 a figure equal to 90 percent of actual capital spending was tested in the equation. The average impact was about -7 percent. However, since the event does not mention any shortage of internally generated funds which accounted for approximately one-half of corporate funds, the impact was discounted and set at 3 percent. Note in this and all other impact calculations the capital shortage cited was assumed to affect only long-term external funds.

Event 55. Wage, Price, Profit, and Interest Rate Controls Are Permanently Established.

The controls that are described in this event were assumed to work (i.e., inflation was reduced to "acceptable" levels). This implies that the economic atmosphere would be improved as the uncertainty which is caused by inflation is reduced. "Real output" should then be increased and thus productivity would be somewhat higher. The increase was estimated at 1 percent.

Event 63. R&D Spending in the United States Increases from the Mid-1970's Level of 2.5 Percent of GNP to 5 Percent of GNP.

The relationship between research and development and productivity, although somewhat obscure, is assumed to be positive. The lags involved in R&D affecting productivity are also somewhat vague and are assumed here to be on the order of 10 years to first impact. The impact estimate was assumed to be 1.5 percent for the TIA analysis.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

It was assumed that once this program was in effect for eight years the quality of the labor force would be increased as less productive older workers leave and younger, better educated workers join the labor force. There has been some significant research done on the role of labor quality in determining productivity. Studies by Denison, Kendrick, and Thurow estimated the contribution of labor quality to productivity. The average estimate of these studies was that labor quality accounts for 14.6 percent of productivity. If we assume this event causes a 5 percent increase in labor quality the impact on productivity is approximately a 0.7 percent increase. This estimate was rounded to 1 percent for use in the TIA analysis.

Event 96. Fifty Percent of Assembly Line Production Is Controlled by Computers.

It was assumed that approximately 20 percent of assembly lines are now controlled by computer. The increase would be 30 percentage points to make one-half of the assembly lines computerized. This would increase productivity and also reduce the amount of labor needed. The increase in productivity in the affected industries resulting from less labor and more output is assumed to be 7 percent. Since 45 percent of GNP is accounted for goods production, and assuming that 80 percent of this production is assembly line, then some 36 percent of GNP is accounted for by goods produced on assembly line. The increase in productivity for this 36 percent is assumed to be 7 percent. The impact on aggregate productivity is then 2.5 percent (7 percent times 36 percent). This was the impact used in the TIA analysis.

Event 97. Middle-Class Attitudes Toward Work Are Challenged by the Rise of Strong Avocational Interests, Resulting in Decreased Demands for Career Advancement Opportunities.

This event implies a very significant alteration in values. The impact on productivity would be negative as workers become less interested in their jobs and are no longer striving to work as much as they once did. The impact estimate, set at -1.5 percent, is simply an intuitive judgment.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

Firms are assumed to spend approximately 20 percent of the decrease in tax on new plant and equipment. This causes an increase in the capital stock and should increase productivity. Using the regression equation which relates productivity and capital spending, one finds the average impact for 1975, 1970, and 1965 was approximately 1.4 percent. The estimate used in the TIA analysis was an increase of 1.4 percent.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

This event would increase the amount of capital generated internally by firms. It was assumed that all of the increase in depreciation would be spent on new plant and equipment. This, of course, increases capital spending. Utilizing the regression equation which relates productivity to capital spending, this added capital increases productivity an average of 2 percent using 1973-1975 as a base for calculations. This was the impact used in the TIA analysis.

```
-19INDEX OF PRODUCTIVITY  -  SCENARIO "D"
-2 7777 4      11  2  4      0.400  8      0.200 1
 04    11     PP*     809000      *     012030
104    11USE OF TELECOMMUNICATIONS REDUCES THE AMOUNT OF
114    11ALL TRAVEL BY 20 PERCENT.
-2 7777 4      53  4 10     -3.000 15     -1.500 1
 04    53     PP*     809000      *     405085
104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
114    53TERM INVESTMENT NEEDS OF INDUSTRY.
-2 7777 4      55  1  5      1.000 10      0.200 1
 04    55     PP*     809000      *     152025
104    55WAGE, PRICE, PROFIT AND INTEREST RATE CONTROLS
114    55ARE PERMANENTLY ESTABLISHED.
-2 7777 4      63  3  9      1.500 15      0.500 1
 04    63     PP*     809000      *     011010
104    63R&D SPENDING IN THE U.S. INCREASES FROM THE
114    63MID 1970'S LEVEL OF 2.5 PERCENT OF GNP TO 5
124    63PERCENT OF GNP.
-2 7777 4      93  2  8      1.000 15      0.200 1
 04    93     PP*     809000      *     105060
104    93THE FEDERAL GOV'T WILL ATTEMPT TO RESTRICT THE
114    93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES TO
124    93ENCOURAGE EARLY RETIREMENT OR HIGHER LEVELS
134    93OF PUBLIC EDUCATION.
-2 7777 4      96  1  5      2.500 10      0.500 1
 04    96     PP*     809000      *     011010
104    96FIFTY PERCENT OF ASSEMBLY LINE PRODUCTION IS
114    96CONTROLLED BY COMPUTERS.
-2 7777 4      97  3 15     -1.500 20      0.200 1
 04    97     PP*     809000      *     051015
104    97MIDDLE CLASS ATTITUDES TOWARDS WORK ARE
114    97CHALLENGED BY THE RISE OF STRONG AVOCA-
124    97TIONAL INTERESTS.
-2 7777 4      98  2  8      2.000 15      1.000 1
 04    98     PP*     809000      *     010510
104    98NEARLY ALL WORKERS UNDERGO JOB RETRAININGS
114    98BECAUSE OF TECHNOLOGICAL OBSOLESCENCE OR
124    98VOLUNTARY CAREER CHANGE.
-2 7777 4     151  3  6      1.400 10      0.300 1
 04   151     PP*     809000      *     101520
104   151CORPORATE INCOME TAX IS REDUCED BY 50
114   151PERCENT FROM 1975 LEVELS.
-2 7777 4     182  1  3      2.000  6      0.700 1
 04   182     PP*     809000      *     304050
104   182ACCELERATED DEPRECIATION ALLOWANCES ARE APPROVED
114   182AND BECOME LAW (20 PERCENT INCREASE OVER 1975
124   182LEVELS).
-2 7777 4     183  1  2     -2.000  4     -0.100 1
 04   183     PP*     809000      *     607080
104   183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70
114   183PERCENT AND REMAINS THERE FOR EIGHT CONSECUTIVE
124   183QUARTERS.
```


TIA Event-Impact Input (Scenario D)

(See p. 2.4 for key to the data.)

Business Expenditures on New Plant and Equipment

BASELINE

The basic fundamental force in the economy which influences expenditures on new plant and equipment is the pace of economic activity. Since the pace of economic activity in each of the scenarios is best described by the behavior and growth of GNP, the baselines of expenditures on new plant and equipment were "keyed" to GNP. This was accomplished by estimating a regression equation, expenditures on new P&E = f(GNP), from 1947 through 1975. The equation had an $\bar{R}^2$ of 0.95. With this equation in hand, assumed values of GNP for each scenario were put into the equation and projected, yielding five different baselines which were used in the TIA analysis.

Regression Equation

```
SPX:>LEAS KEX GNP

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y)                KEX
INDEPENDENT VARIABLE (X)              GNP

NUMBER OF OBSERVATIONS                  28
DETERMINAT OF THE INVERSE MATRIX     1.000E+00

POLYNOMIAL REGRESSION OF DEGREE  1

POLYNOMIAL      CORRELATION     REGRESSION      STD.ERROR       COMPUTED
DEGREE IN X       X VS Y        COEFFICIENT     OF REG.COEF     T VALUE

   1              0.9740         .85497E-02      .39015E-03      21.914

REGRESSION INTERCEPT              -6.9979
MULTIPLE CORRELATION               .97398
STD. ERROR OF ESTIMATE            6.1145
COEFF OF DETERMINATION             .94864
```

```
FA1081
00010      1081   1950    1975    1976    2000    1976        8        0.000      600.000
00020  0.90365760                                    0.00              0.05
00030      1950            49.30           51.67
00040      1951            57.30           53.46
00050      1952            58.30           55.34
00060      1953            61.20           57.29
00070      1954            58.60           59.34
00080      1955            62.40           61.48
00090      1956            70.60           63.71
00100      1957            71.00           66.04
00110      1958            59.80           68.48
00120      1959            61.60           71.04
00130      1960            67.40           73.71
00140      1961            66.10           75.51
00150      1962            70.30           79.44
00160      1963            74.00           82.50
00170      1964            84.50           85.72
00180      1965            96.60           89.09
00190      1966           109.50           92.62
00200      1967           104.30           95.33
00210      1968           108.60          100.21
00220      1969           115.40          104.29
00230      1970           115.50          108.53
00240      1971           111.40          113.03
00250      1972           116.90          117.80
00260      1973           126.80          122.77
00270      1974           128.20          128.00
00280      1975           113.50          133.49
00290      1976             0.00          129.11
00300      1977             0.00          134.84
00310      1978             0.00          139.37
00320      1979             0.00          143.65
00330      1980             0.00          147.49
00340      1981             0.00          150.91
00350      1982             0.00          154.25
00360      1983             0.00          157.41
00370      1984             0.00          160.41
00380      1985             0.00          162.80
00390      1985             0.00          165.02
00400      1987             0.00          166.90
00410      1988             0.00          168.61
00420      1989             0.00          170.41
00430      1990             0.00          172.12
00440      1991             0.00          173.91
00450      1992             0.00          175.79
00460      1993             0.00          177.59
00470      1994             0.00          179.47
00480      1995             0.00          180.92
00490      1996             0.00          182.46
00500      1997             0.00          183.92
00510      1998             0.00          185.46
00520      1999             0.00          186.99
00530      2000             0.00          188.53
```

Baseline Scenario A (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA2081
00010      1081   1950    1975    1976    2000    1976        8       0.000     600.000
00020    0.90365780                                  0.00              0.05
00030    1950            49.30           51.67
00040    1951            57.30           53.46
00050    1952            58.30           55.34
00060    1953            61.20           57.29
00070    1954            58.60           59.34
00080    1955            62.40           61.48
00090    1956            70.60           63.71
00100    1957            71.00           66.04
00110    1958            59.80           68.48
00120    1959            61.60           71.04
00130    1960            67.40           73.71
00140    1961            66.10           76.51
00150    1962            70.30           79.44
00160    1963            74.00           82.50
00170    1964            84.50           85.72
00180    1965            96.60           89.09
00190    1966           109.50           92.62
00200    1967           109.30           96.33
00210    1968           108.60          100.21
00220    1969           115.40          104.29
00230    1970           115.50          108.58
00240    1971           111.40          113.08
00250    1972           116.90          117.80
00260    1973           126.80          122.77
00270    1974           128.20          128.00
00280    1975           113.50          133.49
00290    1976             0.00          129.11
00300    1977             0.00          137.58
00310    1978             0.00          144.50
00320    1979             0.00          151.60
00330    1980             0.00          158.95
00340    1981             0.00          166.22
00350    1982             0.00          173.83
00360    1983             0.00          181.78
00370    1984             0.00          190.07
00380    1985             0.00          198.79
00390    1986             0.00          208.63
00400    1987             0.00          218.97
00410    1988             0.00          229.83
00420    1989             0.00          241.71
00430    1990             0.00          254.11
00440    1991             0.00          267.19
00450    1992             0.00          281.47
00460    1993             0.00          296.43
00470    1994             0.00          312.25
00480    1995             0.00          328.83
00490    1996             0.00          346.28
00500    1997             0.00          364.66
00510    1998             0.00          383.98
00520    1999             0.00          404.33
00530    2000             0.00          425.70
```

Baseline Scenario B (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA3081
00010      1081   1950    1975    1976    2000    1975        8       0.000     600.000
00020    0.90365780                                  0.00             0.05
00030      1950          49.30           51.67
00040      1951          57.30           53.46
00050      1952          58.30           55.34
00060      1953          61.20           57.29
00070      1954          58.60           59.34
00080      1955          62.40           61.48
00090      1956          70.60           63.71
00100      1957          71.00           66.04
00110      1958          59.80           68.48
00120      1959          61.60           71.04
00130      1960          67.40           73.71
00140      1961          66.10           76.51
00150      1962          70.30           79.44
00160      1963          74.00           82.50
00170      1964          84.50           85.72
00180      1965          96.60           89.09
00190      1966         109.50           92.62
00200      1967         109.30           96.33
00210      1968         108.50          100.21
00220      1969         115.40          104.29
00230      1970         115.50          106.58
00240      1971         111.40          113.08
00250      1972         116.90          117.80
00260      1973         126.80          122.77
00270      1974         128.20          128.00
00280      1975         113.50          133.49
00290      1976           0.00          129.11
00300      1977           0.00          137.58
00310      1978           0.00          144.50
00320      1979           0.00          151.60
00330      1980           0.00          158.95
00340      1981           0.00          166.05
00350      1982           0.00          173.49
00360      1983           0.00          181.18
00370      1984           0.00          189.39
00380      1985           0.00          197.77
00390      1986           0.00          207.17
00400      1987           0.00          217.09
00410      1988           0.00          227.35
00420      1989           0.00          238.63
00430      1990           0.00          250.43
00440      1991           0.00          262.74
00450      1992           0.00          276.25
00460      1993           0.00          290.45
00470      1994           0.00          305.24
00480      1995           0.00          320.88
00490      1996           0.00          337.30

00500      1997           0.00          354.48
00510      1998           0.00          372.61
00520      1999           0.00          391.59
00530      2000           0.00          411.51
```

Baseline Scenario C (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA4081
00010      1081    1950    1975    1976    2000    1976        8       0.000      600.000
00020    0.90365780                                  0.00              0.05
00030      1950              49.30              51.67
00040      1951              57.30              53.46
00050      1952              58.30              55.34
00060      1953              61.20              57.29
00070      1954              58.60              59.34
00080      1955              62.40              61.48
00090      1956              70.60              63.71
00100      1957              71.00              66.04
00110      1958              59.80              68.48
00120      1959              61.60              71.04
00130      1960              67.40              73.71
00140      1961              66.10              76.51
00150      1962              70.30              79.44
00160      1963              74.00              82.50
00170      1964              84.50              85.72
00180      1965              96.60              89.09
00190      1966             109.50              92.62
00200      1967             109.30              96.33
00210      1968             108.60             100.21
00220      1969             115.40             104.29
00230      1970             115.50             108.58
00240      1971             111.40             113.08
00250      1972             116.90             117.80
00260      1973             126.80             122.77
00270      1974             128.20             128.00
00280      1975             113.50             133.49
00290      1976               0.00             129.11
00300      1977               0.00             134.34
00310      1978               0.00             139.37
00320      1979               0.00             143.13
00330      1980               0.00             147.07
00340      1981               0.00             151.09
00350      1982               0.00             155.02
00360      1983               0.00             158.87
00370      1984               0.00             162.54
00380      1985               0.00             165.62
00390      1986               0.00             168.36
00400      1987               0.00             171.01
00410      1988               0.00             173.74
00420      1989               0.00             176.39
00430      1990               0.00             179.13
00440      1991               0.00             181.95
00450      1992               0.00             184.77
00460      1993               0.00             187.68
00470      1994               0.00             190.41
00480      1995               0.00             192.98
00490      1996               0.00             195.54
00500      1997               0.00             198.19
00510      1998               0.00             200.67
00520      1999               0.00             203.15
00530      2000               0.00             205.63
```

Baseline Scenario D (billions of 1975 dollars)

(See p. 2.4 for ke
to the data.)

```
FA5081
00010     1081   1950    1975    1976    2000    1976        8       0.000     600.000
00020  0.90365780                                    0.00          0.05
00030  1950            49.30           51.57
00040  1951            57.30           53.46
00050  1952            58.30           55.34
00060  1953            61.20           57.29
00070  1954            58.60           59.34
00080  1955            62.40           61.48
00090  1956            70.60           63.71
00100  1957            71.00           66.04
00110  1958            59.60           68.48
00120  1959            61.60           71.04
00130  1960            67.40           73.71
00140  1961            66.10           76.51
00150  1962            70.30           79.44
00160  1963            74.00           82.50
00170  1964            84.50           85.72
00180  1965            96.60           89.09
00190  1966           109.50           92.62
00200  1967           109.30           96.33
00210  1968           108.60          100.21
00220  1969           115.40          104.29
00230  1970           115.50          108.58
00240  1971           111.40          113.08
00250  1972           116.90          117.80
00260  1973           126.80          122.77
00270  1974           128.20          128.00
00280  1975           113.50          133.49
00290  1976             0.00          129.12
00300  1977             0.00          137.56
00310  1978             0.00          143.90
00320  1979             0.00          149.63
00330  1980             0.00          156.22
00340  1981             0.00          162.37
00350  1982             0.00          168.36
00360  1983             0.00          174.43
00370  1984             0.00          180.84
00380  1985             0.00          187.42
00390  1986             0.00          193.83
00400  1987             0.00          200.42
00410  1988             0.00          207.34
00420  1989             0.00          214.44
00430  1990             0.00          221.02
00440  1991             0.00          227.86
00450  1992             0.00          234.96
00460  1993             0.00          242.23
00470  1994             0.00          249.66
00480  1995             0.00          257.36
00490  1996             0.00          265.31
00500  1997             0.00          273.43
00510  1998             0.00          281.90
00520  1999             0.00          290.53
00530  2000             0.00          299.42
```

Baseline Scenario R (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 10. New Cities Are Developed Proximate to Natural Resources.

Even if one assumes that there will be 5 new cities of 50,000 people each, there is still a good deal of ambiguity. It is, however, clear that the massive capital spending needed to support a new city will certainly affect this indicator. The effect, of course, is positive, but the new expenditures by business in these new locales will probably siphon some of the funds that would have been spent elsewhere. The impact was estimated to be 0.5 percent.

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

Once the cartels cited in this event are established they could either arbitrarily raise prices or could reduce supplies which would lead to a price rise. In either case there would be an increase in the inflation rate. Also if supplies were reduced there could appear some serious bottlenecks which could lead to production shortfalls or the use of expensive substitute materials. Due to the price rise and/or the appearance of serious bottlenecks the impact was set at -2 percent.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

A 10 percent capital shortage was assumed to calculate the impact of this event. Since there are both internal and external sources of funds for capital expenditures the decrease here is not a simple 10 percent decrease. If one assumes that internal fund generation remains the same and long-term external sources decrease by 10 percent, the net impact on capital expenditures is -5.3 percent. The base years for this calculation were 1965-1974.

Event 55. Wage, Price, Profit, and Interest Rate Controls Are Permanently Established.

The basic assumption here was that the controls work and inflation is reduced. It was also assumed that this decrease in inflation directly attributable to controls would result in increased output. This results from the fact that less of the stimulation will be burned up in price increases and therefore real GNP and employment will increase. With this, increase in activity was estimated to affect a 1 percent increase in business capital expenditures.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

Business was assumed to spend approximately 20 percent of the decrease in tax on new capital expenditures. It was further assumed that the increase in expenditures on new plant and equipment caused another increase (i.e., 20 percent of the increment resulting from the tax decrease) equal to 20 percent

of the original increase. Note that the value assumed for the accelerator (1.2) is arbitrary. With these assumptions and using 1975, 1970, and 1965 as bases for calculations the average increase is 4 percent.

The steps in the calculation were as follows: reduce corporate tax by 50 percent; then take 20 percent of this decrease, multiply it by 1.2, and then add this amount to the expenditures figure. Then calculate the increase.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget Is Balanced on an Expenditure Basis.

The occurrence of this event would reduce uncertainty both in credit markets and in industry. The reduction in uncertainty stems from several aspects: first the role of the Federal Reserve is known, so that corporations do not have to discount their plans to account for the vagaries of monetary policy; second, the financial markets themselves are now much more certain of the Federal Reserve; and third, since the budget is balanced the financing requirements of the U.S. Treasury will be smaller and as a result, less of a factor in credit market dynamics. Due to these factors it was assumed that capital spending would increase by approximately 2 percent.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions which Effectively Deny Market Access to the United States.

While this event does not specify the exact shape of these barriers and restrictions, it seems certain that this would lead to a disruption in economic activity. Since these two areas are important to the United States in both trade and investment flows it was estimated that domestic capital expenditures would decrease. The impact was set at -2.5 percent.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

The occurrence of this event would cause an increase of funds generated internally by business. It was assumed that all of the increase was spent on new plant and equipment. If this had occurred in 1972-1975 the average increase in capital expenditures (again assuming that the added expenditure generates additional spending equal to 20 percent of the increase) would have been 3 percent. This was the impact used in the TIA analysis.

Event 184. Corporate Profits Distributed as Dividends Are No Longer Taxed.

It was assumed that the increase in realized dividend payment represented a windfall to investors. These investors would then re-invest this amount by purchasing new equities. Since firms' ability to float new equity would be enhanced, the impact was to increase business expenditures on new plant and equipment by approximately 1 percent.

```
00540   -19CAPITAL EXPENDITURES BY MANUFACTURING - SCENARIO "A"
00550   -2  7777 4      10  1  5      0.500 12      0.200 1
00560    04    10     PP*     809000     *     012035
00570   104    10NEW CITIES ARE DEVELOPED PROXIMATE TO
00580   114    10NATURAL RESOURCES.
00590   -2  7777 4      51  1  5     -2.000  7     -1.000 1
00600    04    51     PP*     809000     *     257090
00610   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00620   114    51MATERIALS: BAUXITE, MANGANESE, TIN, AND
00630   124    51CHROMIUM.
00660   -2  7777 4      53  1  2     -3.300  5     -2.000 1
00670    04    53     PP*     809000     *     101520
00680   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00690   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00720   -2  7777 4      55  1  3      1.000  8      0.200 1
00730    04    55     PP*     809000     *     308095
00740   104    55WAGE, PRICE PROFIT AND INTEREST RATE CONTROLS
00750   114    55ARE PERMANENTLY ESTABLISHED.
00760   -2  7777 4     105  2  4      1.500  6      0.400 1
00770    04   105     PP*     809000     *     010510
00780   104   105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
00790   114   105SYSTEM IN A MAJORITY OF STATES.
00800   -2  7777 4     151  1  3      4.000  5      1.000 1
00810    04   151     PP*     809000     *     010101
00820   104   151CORPORATE INCOME TAX RATE IS REDUCED BY 50
00825   114   151PERCENT FROM 1975 LEVELS.
00830   -2  7777 4     152  1  5      2.000  8      1.000 1
00840    04   152     PP*     809000     *     010101
00850   104   152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00852   114   152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00854   124   152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00856   134   152MONETARY POLICY AS A DISCRETIONARY TOOL,
00858   144   152AND THE FEDERAL BUDGET IS BALANCED.
00870   -2  7777 4     172  1  3     -2.500  8     -0.500 1
00880    04   172     PP*     809000     *     102030
00890   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00900   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH EFFEC-
00910   124   172TIVELY DENY MARKET ACCESS TO THE U.S.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

AAA Corporate Bond Rate

BASELINE

In order to obtain baselines for this indicator it was necessary to make a few rather arbitrary assumptions. When one considers long-term interest rates there are two fundamental questions he must answer; the first is, "What is the real return to capital?" and the second is, "What is the inflation premium?" Most of the literature in the field assumes that the real return to capital is 3-4 percent (note the "real return" to capital is the rate of return minus the inflation premium). For this analysis the real return to capital was assumed to be 3 percent.

The second issue crucial here is the rate of price increase (or perhaps more correctly the anticipated rate of price increase). Creditors, in order to receive their expected "real return," will add an inflation premium. This additional premium is usually equal to the expected rate of inflation over the term until maturity of the bond. The estimates of inflation for the scenarios were:

Scenario A, limited growth	2-4 percent
Scenario B, expansive growth	4-7 percent
Scenario C, individual affluence	4-5 percent
Scenario D, hardship	5-7 percent
Scenario R, resource allocation	2-4 percent

INFLATION ASSUMPTIONS

Scenario A--Limited Growth

The restricted availability of natural resources coupled with high cost energy are the two primary determinants of the minimal economic growth described in this scenario. Although equilibrium is established between resource supply and demand, it is a low-level equilibrium as evidenced by minimal growth in gross national product and in productivity. The Federal Government exerts a strong presence in many sectors. It seems quite probable that this rather stagnant economy would experience inflation rates in the 2-4 percent range reflecting a low-intensity demand which is closely monitored by Federal authorities.

Scenario B--Expansive Growth

The dynamic growing economy in this case is supported by technological advances which remove resource restrictions and result in rapid productivity growth. The description of a "successful capital-oriented" economy implies a strong demand for investible funds met by an adequate supply. The private sector and the market mechanism are functioning quite well with resultant increases in gross national product and disposable income. Depending on the rapidity of growth, inflation should fall within the 4-7 percent range.

Scenario C--Individual Affluence

As in Scenario B, rapid growth is supported by technological advances which alleviate resource constraints and rising productivity. Industry has become more capital intensive with the successful introduction of automation in many industries. Government is contributing to the growth and takes the needed steps to ensure a healthy, growing economy. The demand for capital to support expansion is strong, and the relatively low rate of population increase will free more resources for investment. Given strong demand and a relatively balanced supply, inflation rates would fluctuate in the 4-5 percent range. The lower inflation in this scenario as opposed to Scenario B is the result of government policies which promote growth but not inflation.

Scenario D--Hardship Conditions

This resource-short world has not experienced technical breakthroughs significant enough to remove the constraint of scarcity. Gross national product and industry show only minimal growth. Government controls, although extensive, have not stopped inflation. Investment capital is generally in short supply but the malaise industry is experiencing curtails the demand for funds. As in Scenario A, the economy is stagnant, but this stagnation is somewhat more chaotic and seems more pervasive. Inflation resulting from these conditions should range from 5 to 7 percent.

Scenario R--Resource Allocation

The manner in which the economy evolves in this instance is fundamentally based on public acceptance of the need for and benefits from directed resource allocation. The moderate rate of growth resulting from the successful planning and direction is balanced supporting a moderate demand and supply of goods. Inflation should range from 2 to 4 percent.

Adding these inflation premiums to the real rate of interest yields the baselines for this variable.

Scenario A, 3 + 3 = 6 percent
Scenario B, 3 + 5 = 8 percent
Scenario C, 3 + 4.5 = 7.5 percent
Scenario D, 3 + 6 = 9 percent
Scenario R, 3 + 3 = 6 percent

These baselines were then used in the TIA analysis.

```
FA1085
00010     1085   1950   1975   1976   2000   1976       8      0.0001000000.000
00020  0.96371263                                0.01          -1.02
00030  1950            2.62           2.78
00040  1951            2.86           2.87
00050  1952            2.96           2.97
00060  1953            3.20           3.07
00070  1954            2.90           3.18
00080  1955            3.06           3.29
00090  1956            3.36           3.42
00100  1957            3.89           3.55
00110  1958            3.79           3.70
00120  1959            4.38           3.35
00130  1960            4.41           4.02
00140  1961            4.35           4.19
00150  1962            4.33           4.39
00160  1963            4.26           4.59
00170  1964            4.40           4.82
00180  1965            4.49           5.06
00190  1966            5.13           5.33
00200  1967            5.51           5.61
00210  1968            6.18           5.92
00220  1969            7.03           6.26
00230  1970            8.04           6.63
00240  1971            7.39           7.03
00250  1972            7.21           7.48
00260  1973            7.44           7.96
00270  1974            8.57           8.49
00280  1975            8.83           9.08
00290  1976            0.00           8.00
00300  1977            0.00           7.00
00310  1978            0.00           6.00
00320  1979            0.00           6.00
00330  1980            0.00           6.00
00340  1981            0.00           6.00
00350  1982            0.00           6.00
00360  1983            0.00           6.00
00370  1984            0.00           6.00
00380  1985            0.00           6.00
00390  1986            0.00           6.00
00400  1987            0.00           6.00
00410  1988            0.00           6.00
00420  1989            0.00           6.00
00430  1990            0.00           6.00
00440  1991            0.00           6.00
00450  1992            0.00           6.00
00460  1993            0.00           6.00
00470  1994            0.00           6.00
00480  1995            0.00           6.00
00490  1996            0.00           6.00
00500  1997            0.00           6.00
00510  1998            0.00           6.00
00520  1999            0.00           6.00
00530  2000            0.00           6.00
```

Baseline Scenario A (percent)

(See p. 2.4 for key to the data.)

```
FA2085
00010      1085   1950    1975    1976    2000    1976        B       0.0001000000.000
00020  0.96371263                                  0.01          -1.02
00030      1950            2.62            2.78
00040      1951            2.86            2.87
00050      1952            2.96            2.97
00060      1953            3.20            3.07
00070      1954            2.90            3.18
00080      1955            3.06            3.29
00090      1956            3.36            3.42
00100      1957            3.89            3.55
00110      1958            3.79            3.70
00120      1959            4.38            3.85
00130      1960            4.41            4.02
00140      1961            4.35            4.19
00150      1962            4.33            4.39
00160      1963            4.26            4.59
00170      1964            4.40            4.82
00180      1965            4.49            5.06
00190      1966            5.13            5.33
00200      1967            5.51            5.61
00210      1968            6.18            5.92
00220      1969            7.03            6.26
00230      1970            8.04            6.63
00240      1971            7.39            7.03
00250      1972            7.21            7.48
00260      1973            7.44            7.96
00270      1974            8.57            8.49
00280      1975            8.83            9.06
00290      1976            0.00            8.00
00300      1977            0.00            8.00
00310      1978            0.00            8.00
00320      1979            0.00            8.00
00330      1980            0.00            8.00
00340      1981            0.00            8.00
00350      1982            0.00            8.00
00360      1983            0.00            8.00
00370      1984            0.00            8.00
00380      1985            0.00            8.00
00390      1986            0.00            8.00
00400      1987            0.00            8.00
00410      1988            0.00            8.00
00420      1989            0.00            8.00
00430      1990            0.00            8.00
00440      1991            0.00            8.00
00450      1992            0.00            8.00
00460      1993            0.00            8.00
00470      1994            0.00            8.0
00480      1995            0.00            8.00
00490      1996            0.00            8.00
00500      1997            0.00            8.00
00510      1998            0.00            8.00
00520      1999            0.00            8.00
00530      2000            0.00            8.00
```

Baseline Scenario B (percent)

(See p. 2.4 for key to the data.)

```
FA3085
00010      1085   1950   1975   1976   2000   1976        8       0.0001000000.000
00020     0.96371263                          0.01          -1.02
00030     1950            2.62            2.78
00040     1951            2.85            2.87
00050     1952            2.96            2.97
00060     1953            3.20            3.07
00070     1954            2.90            3.18
00080     1955            3.06            3.29
00090     1956            3.36            3.42
00100     1957            3.89            3.55
00110     1958            3.79            3.70
00120     1959            4.38            3.85
00130     1960            4.41            4.02
00140     1961            4.35            4.19
00150     1962            4.33            4.39
00160     1963            4.26            4.59
00170     1964            4.40            4.82
00180     1965            4.49            5.06
00190     1966            5.13            5.33
00200     1967            5.51            5.61
00210     1968            6.18            5.92
00220     1969            7.03            6.26
00230     1970            8.04            6.63
00240     1971            7.39            7.03
00250     1972            7.21            7.48
00260     1973            7.44            7.96
00270     1974            8.57            8.49
00280     1975            8.83            9.08
00290     1976            0.00            8.00
00300     1977            0.00          7.50
00310     1978            0.00          7.50
00320     1979            0.00          7.50
00330     1980            0.00          7.50
00340     1981            0.00          7.50
00350     1982            0.00          7.50
00360     1983            0.00          7.50
00370     1984            0.00          7.50
00380     1985            0.00          7.50
00390     1986            0.00          7.50
00400     1987            0.00          7.50
00410     1988            0.00          7.50
00420     1989            0.00          7.50
00430     1990            0.00          7.50
00440     1991            0.00          7.50
00450     1992            0.00          7.50
00460     1993            0.00          7.50
00470     1994            0.00          7.50
00480     1995            0.00          7.50
00490     1996            0.00          7.50
00500     1997            0.00          7.50
00510     1998            0.00          7.50
00520     1999            0.00          7.50
00530     2000            0.00          7.50
```

Baseline Scenario C (percent)

(See p. 2.4 for key to the data.)

```
FA4085
00010     1085  1950   1975   1976   2000   1975        8      0.0001000000.000
00020  0.96371263                          0.01          -1.02
00030  1950          2.62          2.78
00040  1951          2.86          2.87
00050  1952          2.96          2.97
00060  1953          3.20          3.07
00070  1954          2.90          3.18
00080  1955          3.06          3.29
00090  1956          3.36          3.42
00100  1957          3.89          3.55
00110  1958          3.79          3.70
00120  1959          4.38          3.85
00130  1960          4.41          4.02
00140  1961          4.35          4.19
00150  1962          4.33          4.39
00160  1963          4.26          4.59
00170  1964          4.40          4.82
00180  1965          4.49          5.06
00190  1966          5.13          5.33
00200  1967          5.51          5.61
00210  1968          6.18          5.92
00220  1969          7.03          6.26
00230  1970          8.04          6.63
00240  1971          7.39          7.03
00250  1972          7.21          7.48
00260  1973          7.44          7.96
00270  1974          8.57          8.49
00280  1975          8.83          9.08
00290  1976          0.00          8.80
00300  1977          0.00          9.00
00310  1978          0.00          9.00
00320  1979          0.00          9.00
00330  1980          0.00          9.00
00340  1981          0.00          9.00
00350  1982          0.00          9.00
00360  1983          0.00          9.00
00370  1984          0.00          9.00
00380  1985          0.00          9.00
00390  1986          0.00          9.00
00400  1987          0.00          9.00
00410  1988          0.00          9.00
00420  1989          0.00          9.00
00430  1990          0.00          9.00
00440  1991          0.00          9.00
00450  1992          0.00          9.00
00460  1993          0.00          9.00
00470  1994          0.00          9.00
00480  1995          0.00          9.00
00490  1996          0.00          9.00
00500  1997          0.00          9.00
00510  1998          0.00          9.00
00520  1999          0.00          9.00
00530  2000          0.00          9.00
```

Baseline Scenario D (percent)

(See p. 2.4 for key to the data.)

```
FA5085
00010     1085   1950    1975    1976    2000    1976        8       0.0001000000.000
00020  0.96371263                                  0.01          -1.02
00030     1950             2.62            2.78
00040     1951             2.86            2.87
00050     1952             2.96            2.97
00060     1953             3.20            3.07
00070     1954             2.90            3.18
00080     1955             3.06            3.29
00090     1956             3.36            3.42
00100     1957             3.89            3.55
00110     1958             3.79            3.70
00120     1959             4.38            3.85
00130     1960             4.41            4.02
00140     1961             4.35            4.19
00150     1962             4.33            4.39
00160     1963             4.26            4.59
00170     1964             4.40            4.82
00180     1965             4.49            5.06
00190     1966             5.13            5.33
00200     1967             5.51            5.61
00210     1968             6.18            5.92
00220     1969             7.03            6.26
00230     1970             8.04            6.63
00240     1971             7.39            7.03
00250     1972             7.21            7.48

00260     1973             7.44            7.96
00270     1974             8.57            8.49
00280     1975             8.83            9.08
00290     1976             0.00            8.00
00300     1977             0.00            7.00
00310     1978             0.00            6.00
00320     1979             0.00            6.00
00330     1980             0.00            6.00
00340     1981             0.00            6.00
00350     1982             0.00            6.00
00360     1983             0.00            6.00
00370     1984             0.00            6.00
00380     1985             0.00            6.00
00390     1986             0.00            6.00
00400     1987             0.00            6.00
00410     1988             0.00            6.00
00420     1989             0.00            6.00
00430     1990             0.00            6.00
00440     1991             0.00            6.00
00450     1992             0.00            6.00
00460     1993             0.00            6.00
00470     1994             0.00            6.00
00480     1995             0.00            6.00
00490     1996             0.00            6.00
00500     1997             0.00            6.00
00510     1998             0.00            6.00
00520     1999             0.00            6.00
00530     2000             0.00            6.00
```

Baseline Scenario R (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

If this event occurred and the cartels were successful in either reducing supply sharply or in raising prices sharply there would be a number of bottlenecks developing or severe price increases. In either case the rate of price increase would increase sharply. In addition, more capital would be demanded domestically as the nation began to develop domestic sources of these materials. These 2 influences would combine to raise the interest rate by 5 percent.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

It was assumed that this event implied a 10 percent capital shortage. It should, however, be noted that a capital shortage is somewhat ambiguous since even though capital may be in short supply relative to demand, one can always obtain the needed amount if one can pay the price. If one knew the relationship between the amount of capital demanded at a set of given interest rates, this impact calculation would be calculable. There is, however, no specified relationship between interest rates (prices) and the amount of capital supplied or demanded. The occurrence of this event was assumed to increase the interest rate by 6 percent.

Event 55. Wage, Price, Profit, and Interest Rate Controls Are Permanently Established.

The imposition of wage, price, profit, and interest rate controls would have two basic effects. The first is that by reducing inflation the magnitude of the inflationary premium would be lowered. Second, since the rates would be controlled, the risk premium would also be lowered somewhat. These two forces would result in an estimated 2 percent decrease.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

This event would increase the amount of investment funds which corporations generate internally. There would be some pressure to make larger dividend payments to stockholders since profits would, in effect, be higher. These two opposing forces would most likely combine to decrease the corporate need for external credit and would cause the rate to drop approximately 4 percent.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget is Balanced on an Expenditure Basis.

The initial effect of balancing the Federal budget (assuming that needs for deficit spending are reduced accordingly) would be to free up investment capital which corporations could then use. The constant growth rule would

remove a great deal of the uncertainty of Federal Reserve policies in the future. These two factors would combine to increase the supply of capital and also to reduce uncertainties associated with that supply. The net effect is estimated at a 3 percent decrease in the bond rate.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The occurrence of this event was assumed to cause a decrease in domestic economic activity. In addition, domestic capital supply would be increased since it could no longer be invested in these countries. The net effect on interest rates would be negative and rather small and was estimated at -2 percent.

Event 181. An Indexing System for All Wages, Prices, Interest Rates, and Profits Is Established.

Usually there is a significant lag for interest rates to reflect significantly inflationary expectations. In fact, in long-term rates this lag is appreciable due to the long period to maturation. This event, however, would have the effect of immediately incorporating the inflation rate into the interest rate. The estimated impact of this event is 5 percent due principally to the certainty that the inflation premium would be included in the interest rate.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

This event would in effect allow firms to generate more needed capital internally through increased depreciation. As a result the corporate demand for funds from external sources would decrease somewhat. This reduction in demand would cause the bond rate to decrease somewhat. The estimated decrease was assumed to be 6 percent.

```
00540   -19AAA BOND RATE A
00550   -2  7777 4      29  1  5     -1.000 10      0.500 1
00560    04    29     PP*     809000      *     015060
00570   104    29CAR LIFETIMES ARE EXTENDED TO DOUBLE 1976
00580   114    29EXPECTED VALUES.
00590   -2  7777 4      51  1  3      5.000 10      1.000 1
00600    04    51     PP*     809000      *     257090
00610   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00620   114    51MATERIALS* BAUXITE, MANGANESE, TIN AND
00630   124    51CHROMIUM.
00660   -2  7777 4      53  1  3      6.000  7      3.000 1
00670    04    53     PP*     809000      *     101520
00680   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00690   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00720   -2  7777 4      55  1  2     -2.000  5     -0.200 1
00730    04    55     PP*     809000      *     308095
00740   104    55WAGE, PRICE, PROFIT AND INTEREST RATE CONTROLS
00750   114    55ARE PERMANENTLY ESTABLISHED.
00760   -2  7777 4     105  2  5     -4.000  8     -1.000 1
00770    04   105     PP*     809000      *     010510
00780   104   105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
00790   114   105SYSTEM IN A MAJORITY OF STATES.
00800   -2  7777 4     151  1  3     -4.000  8     -1.000 1
00810    04   151     PP*     809000      *     010101
00820   104   151CORPORATE INCOME TAX RATE IS REDUCED BY 50
00825   114   151PERCENT FROM 1975 LEVELS.
00830   -2  7777 4     152  2  5     -3.000 10     -1.000 1
00840    04   152     PP*     809000      *     010101
00850   104   152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00854   114   152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00858   124   152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00862   134   152MONETARY POLICY AS A DISCRETIONARY TOOL,
00865   144   152AND THE FEDERAL BUDGET IS BALANCED.
00870   -2  7777 4     172  1  3     -2.000  8     -0.900 1
00880    04   172     PP*     809000      *     102030
00890   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00891   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00892   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00900   -2  7777 4     181  1  3      5.000  6      2.000 1
00910    04   181     PP*     809000      *     010101
00920   104   181AN INDEXING SYSTEM FOR ALL WAGES, PRICES
00921   114   181INTEREST RATES, AND PROFITS IS ESTABLISHED.
00930   -2  7777 4     182  1  2     -6.000  5     -2.000 1
00940    04   182     PP*     809000      *     010510
00950   104   182ACCELERATED DEPRECIATION ALLOWANCES ARE APPROVED
00960   114   182AND BECOME LAW (20 PERCENT INCREASE OVER 1975
00961   124   182LEVELS).
00970   -2  7777 4     183  1  3     -4.000  6     -1.000 1
00980    04   183     PP*     809000      *     606060
00990   104   183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%
00995   114   183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
01000   -2  7777 4     186  2  4      2.000  8      0.500 1
01010    04   186     PP*     809000      *     011520
01020   104   186THE STOCK OF CAPITAL PER WORKER AVERAGES 2.5
01030   114   186PERCENT GROWTH FOR A TEN-YEAR PERIOD.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Percentage of Investment Funds Generated Internally by Business

BASELINE

This indicator was included in the scenarios to depict the relative dependence of business on internally generated funds for investment. Historically the trend of business reliance on internal funds has been declining, and this fact reflects the growth of credit markets and also certain tax and cost advantages which are gained by using external sources of funds (i.e., bonds, equity, and mortgages). There is little doubt that the health of the economy also plays a very significant role in determining business access to and/or success in obtaining external credit. Thus, one would expect an economy which is quite stagnant to differ markedly from one which is rapidly growing in respect to business reliance on external vs. internal funds for investment. As a result, it was determined that distinct baselines were needed for each scenario.

The regression approach was used initially but yielded unsatisfactory results. Due to the significant variability in the internal funds percent historically, a ten-year moving average was calculated and used as the historical time series. From 1956 to 1975 this variable decreased at a 1 percent annual rate, while GNP was rising at an annual rate of 2.9 percent. A ratio expression was derived and used to obtain estimated growth rates for this indicator.

$$\frac{\text{historical GNP growth rate}}{\text{historical internal funds percent growth rate}} = \frac{\text{assumed GNP growth rate}}{\text{estimate of internal funds percent growth rate}}$$

The growth rates were

Scenario A	0.50 percent
Scenario B	1.70 percent
Scenario C	1.60 percent
Scenario D	0.60 percent
Scenario R	1.13 percent

Projections out to 2000 were obtained by applying these rates to the 1975 value. These baselines were then used in the TIA analysis.

```
FA1084
00010      1084   1956   1975   1975   2000   1976       2      42.000     100.00
00020   0.63304171                              -0.00              2.12
00030      1956          66.00          71.68
00040      1957          68.90          70.92
00050      1958          69.50          70.17
00060      1959          61.20          69.42
00070      1960          69.00          68.68
00080      1961          70.00          67.95
00090      1962          70.00          67.23
00100      1963          69.00          66.52
00110      1964          68.00          65.81
00120      1965          68.30          65.11
00130      1966          68.10          64.42
00140      1967          67.30          63.73
00150      1968          65.50          63.05
00160      1969          64.20          62.38
00170      1970          62.60          61.72
00180      1971          61.70          61.07
00190      1972          60.00          60.42
00200      1973          57.90          59.77
00210      1974          55.30          59.14
00220      1975          56.20          58.51
00230      1976           0.00          55.9
00240      1977           0.00          55.6
00250      1978           0.00          55.4
00260      1979           0.00          55.1
00270      1980           0.00          54.8
00280      1981           0.00          54.5
00290      1982           0.00          54.3
00300      1983           0.00          54.0
00310      1984           0.00          53.7
00320      1985           0.00          53.4
00330      1986           0.00          53.2
00340      1987           0.00          52.9
00350      1988           0.00          52.7
00360      1989           0.00          52.4
00370      1990           0.00          52.1
00380      1991           0.00          51.9
00390      1992           0.00          51.6
00400      1993           0.00          51.4
00410      1994           0.00          51.1
00420      1995           0.00          50.8
00430      1996           0.00          50.6
00440      1997           0.00          50.3
00450      1998           0.00          50.1
00460      1999           0.00          49.8
00470      2000           0.00          49.6
```

Baseline Scenario A (percent)

(See p. 2.4 for key to the data.)

```
FA2084
00010     1084   1956   1975   1976   2000   1976      2     42.000     100.000
00020  0.63304171                          -0.00          2.12
00030  1956          66.00          71.68
00040  1957          68.90          70.92
00050  1958          69.50          70.17
00060  1959          61.20          69.42
00070  1960          69.00          68.68
00080  1961          70.00          67.95
00090  1962          70.00          67.23
00100  1963          69.00          66.52
00110  1964          66.00          65.81
00120  1965          68.30          65.11
00130  1966          68.10          64.42
00140  1967          67.30          63.73
00150  1968          65.50          63.05
00160  1969          64.20          62.38
00170  1970          62.60          61.72
00180  1971          61.70          61.07
00190  1972          60.00          60.42
00200  1973          57.90          59.77
00210  1974          55.30          59.14
00220  1975          56.20          58.51
00230  1976           0.00          55.2
00240  1977           0.00          54.3
00250  1978           0.00          53.4
00260  1979           0.00          52.5
00270  1980           0.00          51.6
00280  1981           0.00          50.7
00290  1982           0.00          49.8
00300  1983           0.00          49.0
00310  1984           0.00          48.2
00320  1985           0.00          47.3
00330  1986           0.00          46.5
00340  1987           0.00          45.7
00350  1988           0.00          45.0
00360  1989           0.00          44.2
00370  1990           0.00          43.4
00380  1991           0.00          42.7
00390  1992           0.00          42.0
00400  1993           0.00          41.3
00410  1994           0.00          40.6
00420  1995           0.00          40.0
00430  1996           0.00          39.2
00440  1997           0.00          38.5
00450  1998           0.00          37.9
00460  1999           0.00          37.2
00470  2000           0.00          36.6
```

Baseline Scenario B (percent)

(See p. 2.4 for key to the data.)

```
FA3084
00010     1084   1956   1975   1976   2000   1976      2     42.000     100.000
00020   0.63304171                          -0.00        2.12
00030     1956          66.00          71.68
00040     1957          68.90          70.92
00050     1958          69.50          70.17
00060     1959          61.20          69.42
00070     1960          69.00          68.68
00080     1961          70.00          67.95
00090     1962          70.00          67.23
00100     1963          69.00          66.52
00110     1964          68.00          65.81
00120     1965          68.30          65.11
00130     1966          68.10          64.42
00140     1967          67.30          63.73
00150     1968          65.50          63.05
00160     1969          64.20          62.38
00170     1970          62.60          61.72
00180     1971          61.70          61.07
00190     1972          60.00          60.42
00200     1973          57.90          59.77
00210     1974          55.30          59.14
00220     1975          56.20          58.51
00230     1976           0.00          55.3
00240     1977           0.00          54.4
00250     1978           0.00          53.5
00260     1979           0.00          52.7
00270     1980           0.00          51.8
00280     1981           0.00          51.0
00290     1982           0.00          50.2
00300     1983           0.00          49.4
00310     1984           0.00          48.6
00320     1985           0.00          47.8
00330     1986           0.00          47.1
00340     1987           0.00          46.3
00350     1988           0.00          45.6
00360     1989           0.00          44.8
00370     1990           0.00          44.1
00380     1991           0.00          43.4
00390     1992           0.00          42.7
00400     1993           0.00          42.0
00410     1994           0.00          41.4
00420     1995           0.00          40.7
00430     1996           0.00          40.0
00440     1997           0.00          39.4
00450     1998           0.00          38.8
00460     1999           0.00          38.2
00470     2000           0.00          37.6
```

Baseline Scenario C (percent)

(See p. 2.4 for key to the data.)

```
FA4084
00010      1084   1956   1975   1976   2000   1975        2      42.000     100.00
00020    0.63304171                              -0.00              2.12
00030    1956            66.00            71.68

00040    1957            68.90            70.92
00050    1958            69.50            70.17
00060    1959            61.20            69.42
00070    1960            69.00            68.68
00080    1961            70.00            67.95
00090    1962            70.00            67.23
00100    1963            69.00            66.52
00110    1964            68.00            65.81
00120    1965            68.30            65.11
00130    1966            68.10            64.42
00140    1967            67.30            63.73
00150    1968            65.50            63.05
00160    1969            64.20            62.38
00170    1970            62.60            61.72
00180    1971            61.70            61.07
00190    1972            60.00            60.42
00200    1973            57.90            59.77
00210    1974            55.30            59.14
00220    1975            56.20            58.51
00230    1976             0.00            55.9
00240    1977             0.00            55.5
00250    1978             0.00            55.2
00260    1979             0.00            54.9
00270    1980             0.00            54.5
00280    1981             0.00            54.2
00290    1982             0.00            53.9
00300    1983             0.00            53.6
00310    1984             0.00            53.2
00320    1985             0.00            52.9
00330    1986             0.00            52.6
00340    1987             0.00            52.3
00350    1988             0.00            52.0
00360    1989             0.00            51.7
00370    1990             0.00            51.3
00380    1991             0.00            51.0
00390    1992             0.00            50.7
00400    1993             0.00            50.4
00410    1994             0.00            50.1
00420    1995             0.00            49.8
00430    1996             0.00            49.5
00440    1997             0.00            49.2
00450    1998             0.00            48.9
00460    1999             0.00            48.6
00470    2000             0.00            48.3
```

Baseline Scenario D (percent)

(See p. 2.4 for key to the data.)

```
FA5084
00010      1084   1956   1975   1976   2000   1976        2      42.000     100.000
00020     0.63304171                              -0.00            2.12
00030     1956          66.00          71.68
00040     1957          68.90          70.92
00050     1958          69.50          70.17
00060     1959          61.20          69.42
00070     1960          69.00          68.68
00080     1961          70.00          67.95
00090     1962          70.00          67.23
00100     1963          69.00          66.52
00110     1964          68.00          65.81
00120     1965          68.30          65.11
00130     1966          68.10          64.42
00140     1967          67.30          63.73
00150     1968          65.50          63.05
00160     1969          64.20          62.38
00170     1970          62.60          61.72
00180     1971          61.70          61.07
00190     1972          60.00          60.42
00200     1973          57.90          59.77
00210     1974          55.30          59.14
00220     1975          56.20          58.51
00230     1976           0.00          55.6
00240     1977           0.00          55.1
00250     1978           0.00          54.5
00260     1979           0.00          54.0
00270     1980           0.00          53.4
00280     1981           0.00          52.9
00290     1982           0.00          52.4
00300     1983           0.00          51.9
00310     1984           0.00          51.3
00320     1985           0.00          50.8
00330     1986           0.00          50.3
00340     1987           0.00          49.8
00350     1988           0.00          49.3
00360     1989           0.00          48.8
00370     1990           0.00          48.3
00380     1991           0.00          47.9
00390     1992           0.00          47.4
00400     1993           0.00          46.9
00410     1994           0.00          46.4
00420     1995           0.00          46.0
00430     1996           0.00          45.5
00440     1997           0.00          45.1
00450     1998           0.00          44.6
00460     1999           0.00          44.2
00470     2000           0.00          43.7
```

Baseline Scenario R (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 53. Capital Resources Are Not Able To Meet Long-Term Investment Needs of Industry.

A 10 percent capital shortage was assumed for this event. If all external sources of credit had been 10 percent lower than they actually were from 1960 to 1975, the amount of funds generated internally as a percent of total sources would have been 4.2 percent higher on the average. Assuming that interest rates would have risen due to the capital shortage, external funds would have been utilized less. An estimated impact of 5 percent was used in the TIA analysis.

Note the data for sources of funds is found in the Economic Report of the President, Table B-78 (January 1976).

Event 55. Wage, Price, Profit, and Interest Rate Controls Are Permanently Established.

It was assumed that the imposition of controls would eliminate some of the uncertainty which exists in credit markets. In addition, however, the controls would probably have the effect of reducing potential gains, particularly in the equity market. The net effect of these two forces would be a slight reduction of external funds available for corporate borrowers. The internal funds percent would rise slightly--approximately 1 percent.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

This event would increase the amount of funds generated internally since the amount saved in taxes could be kept as retained earnings or some portion could be distributed as profits. In order to calculate the impact three assumptions were made: one-third of the amount saved in taxes is distributed as dividends, one-third is used to reduce long-term debt, and the last third is used as internal funds for investment. If this had been done in 1974, 1965, and 1960, the average increase in the internal funds percent would have been approximately 4 percent, and the figure was used in the TIA analysis.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget Is Balanced on an Expenditure Basis.

The major impact of this event would be in removing some of the uncertainty in the credit markets caused by two factors: the first is the general uncertainty surrounding Federal Reserve policies, and the second is the amount of financing by the Treasury to support the Federal budget. Also, since the event implies a withdrawal of government and less spending, there would be less pressure in the credit markets. The estimated impact is -2 percent since firms will find external financing easier and the credit market itself will be stabilized somewhat.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

It is assumed that the occurrence of this event will simply provide firms with more internally generated funds. To calculate this the increase in depreciation was added into internal funds and a new internal funds percent was calculated. Doing this for 1972 through 1975, the average increase in the internal funds percent is 2 percent, and this was used as the impact estimate.

Event 184. Corporate Profits Distributed as Dividends Are No Longer Taxed.

The "extra" dividends received by investors were assumed to represent a windfall and all were re-invested (i.e., added to external funds supply). In addition, this new supply (old external plus re-invested dividends) was multiplied by 1.5 percent to account for the fact that the equity market would benefit from this occurrence. This was done for 1971-1975, and the average decrease in the internal funds percent was 3 percent. This was used as the impact estimate.

```
00480   -19PER-CENT INTERNAL FINANCE A
00490   -2  7777 4     53  1  5     5.000  5     2.000 1
00500    04    53    PP*    809000    *    101520
00510   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00530   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00550   -2  7777 4     55  1  3     1.000  8     0.200 1
00560    04    55    PP*    809000    *    306095
00570   104    55WAGE, PRICE, PROFIT AND INTEREST CONTROLS
00580   114    55ARE PERMANENTLY ESTABLISHED.
00590   -2  7777 4    105  2  5    -2.000 10    -1.000 1
00600    04   105    PP*    809000    *    010510
00610   104   105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
00620   114   105SYSTEM IN A MAJORITY OF STATES.
00630   -2  7777 4    151  1  4     4.000  8     2.000 1
00640    04   151    PP*    809000    *    010101
00650   104   151CORPORATE INCOME TAX RATE IS REDUCED BY 50
00655   114   151PERCENT FROM 1975 LEVELS.
00660   -2  7777 4    152  1  3    -2.000  6    -1.000 1
00670    04   152    PP*    809000    *    010101
00680   104   152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00684   114   152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00688   124   152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00692   134   152MONETARY POLICY AS A DISCRETIONARY TOOL,
00696   144   152AND THE FEDERAL BUDGET IS BALANCED.
00700   -2  7777 4    180  1  3     0.500  6     0.200 1
00710    04   180    PP*    809000    *    101010
00720   104   180TAX LEVIES ON CAPITAL GAINS ARE REDUCED 50%
00725   114   180FROM CURRENT LEVELS.
00730   -2  7777 4    182  1  2     2.000  5     0.500 1
00740    04   182    PP*    809000    *    010510
00750   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00756   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH EFFEC-
00762   124   172TIVELY DENY MARKET ACCESS TO THE U.S.
00770   -2  7777 4    183  1  2    -1.000  5    -0.200 1
00780    04   183    PP*    809000    *    606060
00790   104   183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%
00795   114   183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
00800   -2  7777 4    184  1  5    -3.000 10    -0.500 1
00810    04   184    PP*    809000    *    010101
00820   104   184CORPORATE PROFIT DISTRIBUTED AS DIVIDENDS
00830   114   184ARE NO LONGER TAXED.
00840   -2  7777 4    189  2  4     2.000  8     0.500 1
00850    04   189    PP*    809000    *    051520
00860   104   189THE AMOUNT OF MORTGAGE DEBT OUTSTANDING HELD BY
00870   114   189FEDERAL AND RELATED AGENCIES DOUBLES (1975 -
00880   124   189$88.1 BILLION).
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

All Government Spending as a Percent of Gross National Product

BASELINE

Several attempts to generate separate baselines for this indicator via regression analysis and a growth rate ratio approach yielded estimates which were unsatisfactory (i.e., in high-growth scenarios the baselines estimated had values much too high in the late 1990's). A single baseline, however, gives a good fit to the historic data ($R^2 = 0.86$) and shows that as the gross national product increases, the growth rate of the percentage of government spending, while still positive, decreases as one might expect.

```
FA1090
00010    1090   1950   1975   1976   2000   1975        8      0.000     100.000
00020  0.85612342                          0.00          0.05
00030    1950          21.31          23.91
00040    1951          23.98          24.22
00050    1952          27.04          24.53
00060    1953          27.73          24.85
00070    1954          26.49          25.18
00080    1955          24.53          25.51
00090    1956          24.83          25.85
00100    1957          26.03          26.20
00110    1958          28.42          26.55
00120    1959          26.93          26.90
00130    1960          26.96          27.26
00140    1961          28.49          27.63
00150    1962          28.46          28.01

00160    1963          28.21          28.39
00170    1964          27.73          28.76
00180    1965          27.30          29.18
00190    1966          28.36          29.58
00200    1967          30.44          29.99
00210    1968          30.96          30.41
00220    1969          30.53          30.83
00230    1970          31.75          31.26
00240    1971          32.02          31.70
00250    1972          31.64          32.15
00260    1973          30.99          32.61
00270    1974          32.47          33.07
00280    1975          35.01          33.55
00290    1976           0.00          33.5
00300    1977           0.00          34.1
00310    1978           0.00          34.6
00320    1979           0.00          35.2
00330    1980           0.00          35.7
00340    1981           0.00          36.3
00350    1982           0.00          36.9
00360    1983           0.00          37.5
00370    1984           0.00          38.1
00380    1985           0.00          38.7
00390    1986           0.00          39.3
00400    1987           0.00          39.9
00410    1988           0.00          40.6
00420    1989           0.00          41.2
00430    1990           0.00          41.9
00440    1991           0.00          42.5
00450    1992           0.00          43.2
00460    1993           0.00          43.9
00470    1994           0.00          44.6
00480    1995           0.00          45.3
00490    1996           0.00          46.1
00500    1997           0.00          46.8
00510    1998           0.00          47.5
00520    1999           0.00          48.3
00530    2000           0.00          49.1
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 47. More Than 10,000 Miles of the Interstate Highway System Are Electrified and Automated to Accommodate Dual-Mode Automobiles.

It was assumed that the cost of building this system would be approximately $30 billion and that the work would be completed in 10 years. Eighty percent of the funds would be newly budgeted and the remaining 20 percent would be obtained by shifting already budgeted funds. Thus the net increase in spending is $24 billion. If we assume the money is spent equally over 10 years, government spending increases $2.4 billion each year. If we had added $2.4 billion to government spending, the increase in all government spending as a percent of GNP would be 0.3 percent in 1975 and 0.5 percent in 1976. Thus, an impact of 0.4 percent was selected. It should be noted that this spending would, of course, have some negligible impact on GNP, but it was assumed that this would be offset by increases in lower level government spending to administer the program at the local level.

Event 54. The DOD Budget Increases to at Least 50 Percent of the Federal Budget (About 27 Percent in 1975).

It was assumed that there would be some internal priority shifts within the budget to bring defense spending up to this level. Note, however, no drastic cuts occur in social programs. The total Federal budget was assumed to increase by 10 percent (or $32.5 billion in 1975 and/or $26.8 billion in 1974).

The impact of this increase on GNP was assumed to be 1.5 times the additional spending. In 1974 if we add $26.8 billion to government spending and $40.2 billion to GNP, the share of government spending increases by approximately 2.8 percent. In 1975 if we add $32.5 billion to government spending and $49 billion to GNP, the increase in this indicator is 2.9 percent. This latter figure was chosen as the impact.

Event 59. A Publicly Owned Petroleum Company Is Established Which Supplies 20 Percent of the Domestic Market.

It was assumed that the government would simply purchase facilities which supplied 20 percent of the market. Further, it was assumed that in any given year after the purchase sales would approximate costs of operation. Following this line of reason there would be a simple shift of activity from the private to public sector. In 1974 total sales of the petroleum industry equaled about $165 billion--20 percent of this amount is $33 billion. Thus, government spending would increase by that amount, increasing the percentage of government spending by approximately 4.5 percent. This was the impact estimate used.

Event 63. R&D Spending in the United States Increases from the Mid-1970's Level of 2.5 Percent of GNP to 5 Percent of GNP.

In 1975 if all R&D was equal to 5 percent of GNP, it would have accounted for $75.8 billion. In 1975 Federally supported R&D was equal to approximately

53 percent of all R&D. Assuming that this balance would be maintained, government would account for 53 percent of the increased R&D spending. The increase would be equal to $37.9 billion ($75.8 times 0.5), and government taking 53 percent would spend approximately $20 billion. Adding this to government spending increases the government spending percent by approximately 3.5 percent, and this was the impact used.

Event 64. All U.S. Railroads Are Nationalized.

This event would affect a simple transfer of activity from the private to public sector. It was assumed that the nationalized railroads would lose money (i.e., costs would exceed revenues). In 1972 and 1973 revenues earned by railroads were $11 billion and $12 billion, respectively. If revenues were equal to costs, government spending would have increased by that amount. But, since it was assumed that the railroads would continue to lose money, expenditures would have been $15 billion in 1972 and 1973. If this were the case the government percentage of GNP would have increased by about 4 percent. This was the impact estimate used.

Event 65. The Transportation, Communication, and Energy Industries Become Either Public or Quasi-Public Enterprises.

If this event were to occur it would result in a massive shift of activity from the private to public sector. It was assumed that these industries would be operated on a break-even basis (i.e., costs equal to revenues). In 1974 sales of the petroleum industry ($165 billion), electric utilities ($39 billion), natural gas ($15 billion), air transportation ($28 billion), and telephone industry ($29 billion) totaled about $52 billion. Due to the ambiguity of this event a figure of $140 billion was used to approximate the dollar shift from private to public sector. This shift would increase the government spending by about 30 percent, and this is the impact used.

Event 75. A National Program of Socialized Medicine is Established.

This event would cause a significant transfer of activity from the private sector to the public. There are many ways in which this plan could be implemented, and there are many levels of coverage which could be established. It was assumed that the program would increase governmental expenditures by approximately $50 billion and that this amount would be equal to the reduction in private health expenditures, thus leaving GNP unchanged. With these assumptions the government spending percent would increase by approximately 10 percent, and this figure was used as the impact estimate.

Event 77. Congress Enacts a New Tax on Goods and Services Proportional to Their Environmental Impact, Allocating These Funds for Environmental Improvements.

The tax base on which this event would impact was assumed to be personal consumption expenditures. It was assumed that the government

in spending these tax receipts would have no impact on GNP since the funds would have been spent by consumers in lieu of the tax. A 1 percent tax would yield revenues of about $10 billion, and a 6 percent tax would yield revenues of about $60 billion. At the lower tax level, assuming all funds were spent, the government spending percent would increase by about 2 percent. At the higher level there would be an 11 percent increase. Assuming the tax would be in this range, the impact chosen was 5.5 percent.

Event 78. Federal Funds for Community Development, to Revitalize Cities, Increase Threefold over the 1975 Level (Community Development Funds Totaled $3.2 Billion in 1975).

The level of spending implied by this event is $9.6 billion. Of this total 80 percent was designated as new funds which increased the budget. The other 20 percent was raised by shifts in budget priorities. Assuming that the increase in GNP is 1.5 times the amount of the increase (8 x 1.5 = 12), the impact of this event increases the government spending percent by approximately 1 percent.

In 1975 all government spending was approximately $530 billion. With the increase of $8 billion it becomes $538 billion, which is about 35.3 percent of GNP. Since the government spending percent was 35 percent, without the increase in spending there is a 1 percent increase.

Event 82. A Progressive Tax Is Imposed on All Energy Usage with the Proceeds Funneled into Energy Production and Conservation R&D Programs.

This event implies a transfer of funds from the private to public sector. It was assumed that the amount of the tax collected and spent was $15 billion. This activity was assumed to leave GNP unchanged and, thus, raises the government spending percent by approximately 2.5 percent.

Event 89. Federal Funds Are Withheld in Order to Stop Urban Expressway Construction.

Federal aid to state and local governments for urban expressway construction was about $0.7 billion in 1975. If this was not spent, governmental expenditures would drop by that amount, causing the government spending percent to drop by about 0.15 percent. This impact was used for the TIA analysis.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

This event has two distinct primary impacts. The first would be to increase Social Security payments to retirees. A 10 percent increase was assumed (this would have been a $6.7 billion increase in 1975). The second impact would be on schooling costs both locally and on a Federal basis. It was assumed that the Federal Government covered the bulk of these costs, and the amount of increase was $8.8 billion. This adds approximately $15 billion to government spending and causes the government spending percent to increase by about 2.8 percent.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget is Balanced on an Expenditure Basis.

It was assumed that this event would cause a relative shrinkage of government activity. Since the event is qualitative (no specific levels of spending are assumed), a reduction in government spending of approximately $40 billion is assumed, resulting in a reduction of about 7 percent in the government spending percent.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The occurrence of this event was assumed to cause a 1 percent decrease in GNP. This impact, of course, is an arbitrary estimate. In response to the decline of economic activity the Federal Government was assumed to increase spending by about $15 billion. The net impact on the government spending percent would be a 3.8 percent increase. Note this estimate is based on 1975 figures for GNP and government spending.

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UNCLASSIFIED 276-72-05/03 NL

2 OF 3
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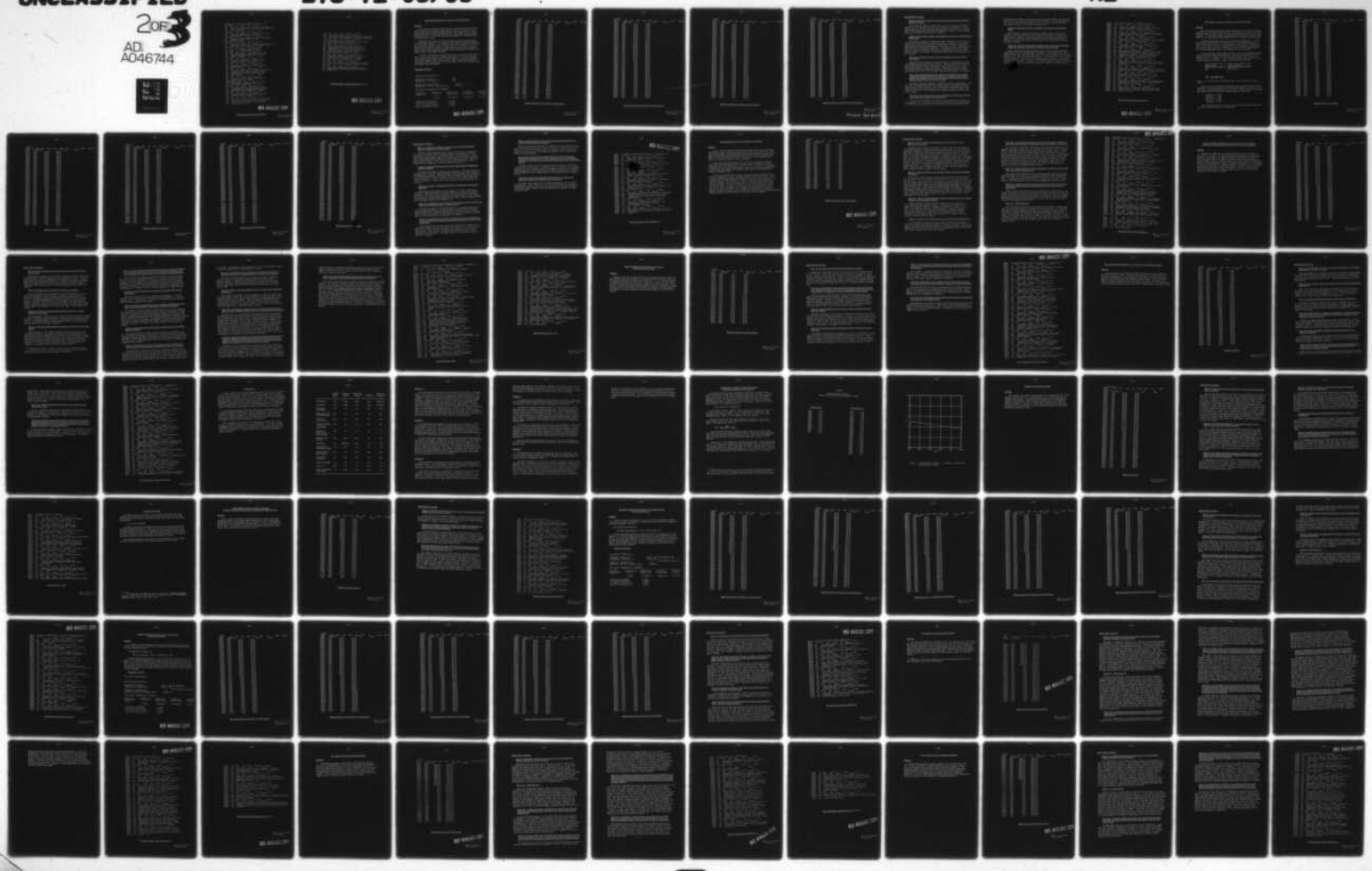

```
-19TOTAL GOV'T SPENDING AS A PERCENT OF GNP   -  "A"
-2  7777 4      47  1  2     2.500  8     0.200 1
 04     47    PP*    809000     *    011020
104     47MORE THAN 10,000 MILES OF THE INTERSTATE HIGH-
114     47WAY ARE ELECTRIFIED AND AUTOMATED TO ACCOMMODATE DUAL-
124     47MODE AUTOMOBILES.
-2  7777 4      54  1  3     2.900  6     0.400 1
 04     54    PP*    809000     *    050510
104     54THE DOD BUDGET INCREASES TO AT LEAST 50% OF THE
114     54FEDERAL BUDGET (ABOUT 27% IN 1975).
-2  7777 4      59  1  3     4.500  5     3.000 1
104     59A PUBLICLY OWNED PETROLEUM COMPANY IS ESTABLISHED
114     59WHICH SUPPLIES 20 PERCENT OF THE
124     59DOMESTIC MARKET.
-2  7777 4      63  1  2     3.500  5     1.000 1
 04     63    PP*    809000     *    102030
104     63R&D SPENDING IN THE U.S. INCREASES FROM THE MID 1970'S
114     63LEVEL OF 2.5 PERCENT OF GNP TO 5 PERCENT OF GNP.
-2  7777 4      64  1  5     4.000  5     4.000 1
 04     64    PP*    809000     *    405060
104     64ALL U.S. RAILROADS ARE NATIONALIZED.
-2  7777 4      65  1  5    30.000 10    20.000 1
 04     65    PP*    809000     *    010510
104     65THE TRANSPORTATION, COMMUNICATION AND ENERGY
114     65INDUSTRIES BECOME EITHER PUBLIC OR QUASI-
124     65PUBLIC ENTERPRISES.
-2  7777 4      73  1  3     6.000  8     3.000 1
 04     73    PP*    809000     *    104050
104     73LEGISLATION PROVIDING A GUARANTEED MINIMUM
114     73ANNUAL INCOME FOR U.S. CITIZENS.
-2  7777 4      75  1  3    10.000 10    8.000 1
 04     75    PP*    809000     *    012545
104     75A NATIONAL PROGRAM OF SOCIALIZED MEDICINE IS
114     75ESTABLISHED.
-2  7777 4      77  1  3     5.500  8     2.000 1
 04     77    PP*    809000     *    304050
104     77CONGRESS ENACTS A NEW TAX ON GOODS AND SERVICES
114     77PROPORTIONAL TO THEIR ENVIRONMENTAL IMPACT,
124     77ALLOCATING THESE FUNDS FOR ENVIRONMENTAL
134     77IMPROVEMENTS.
-2  7777 4      78  1  1     1.000  5     0.200 1
 04     78    PP*    809000     *    205070
104     78FEDERAL FUNDS FOR COMMUNITY DEVELOPMENT, TO
114     78REVITALIZE CITIES, INCREASE
 1THREEFOLD OVER THE
124     781975 LEVEL.  (COMMUNITY DEVELOPMENT FUNDS
134     78TOTALLED $3.2 BILLION IN 1975).
-2  7777 4      82  1  2     2.500  6     2.000 1
 04     82    PP*    809000     *    306070
104     82A PROGRESSIVE TAX IS IMPOSED ON ALL ENERGY
114     82USAGE WITH THE PROCEEDS FUNNELED INTO ENERGY
124     82PRODUCTION AND CONSERVATION R&D PROGRAMS.
-2  7777 4      89  1  2    -1.000  5    -1.000 1
 04     89    PP*    809000     *    205070
104     89FEDERAL FUNDS ARE WITHHELD IN ORDER TO STOP
114     89URBAN EXPRESSWAY CONSTRUCTION.
-2  7777 4      93  1  2     2.800  2     2.800 1
 04     93    PP*    809000     *    105060
104     93THE FEDERAL GOVERNMENT ATTEMPTS TO RESTRICT THE
114     93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES TO
124     93ENCOURAGE EARLY RETIREMENT OR HIGHER LEVELS
134     93OF PUBLIC EDUCATION.
```


TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

```
-2  7777 4      98   1 10      7.500 20      5.000 1
 04     98     PP*     809000     *     011020
104     98NEARLY ALL WORKERS UNDERGO JOB RETRAINING BECAUSE OF
114     98TECHNOLOGICAL OBSOLESCENCE OR VOLUNTARY CAREER CHANGE.
-2  7777 4     105   2  5    -15.000 10    -10.000 1
 04    105     PP*     809000     *     010510
104    105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
114    105SYSTEM IN A MAJORITY OF STATES.
-2  7777 4     152   1  5    -15.000 10    -10.000 1
 04    152     PP*     809000     *     010101
104    152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
114    152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
124    152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
134    152MONETARY POLICY AS A DISCRETIONARY TOOL,
144    152AND THE FEDERAL BUDGET IS BALANCED.
-2  7777 4     172   1  3      3.800  6      0.200 1
 04    172     PP*     809000     *     102035
104    172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
114    172TRADE AND INVESTMENT RESTRICTIONS WHICH
124    172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
-2  7777 4     183   1  2      5.000  4      0.500 1
 04    183     PP*     809000     *     606060
104    183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%
114    183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
-2  7777 4     189   1  3      2.000  5      0.200 1
 04    189     PP*     809000     *     051520
104    189THE AMOUNT OF MORTGAGE DEBT OUTSTANDING HELD BY
114    189FEDERAL AND RELATED AGENCIES DOUBLES (1975=$88.1
124    189BILLIONS).
```

TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

Long-Term Funds Raised by Business in Credit Markets

BASELINE

The foremost influences on the amount of long-term investment funds raised by business in credit markets are the health and vitality of the crdit market itself and the need of business to tap this source. When economic activity is strong and growing the credit market is most always functioning well. At the same time business demand for investment funds is usually quite strong.

Therefore, the behavior of this indicator is greatly influenced by the growth and behavior of the economy. Since GNP is a primary indicator of the economic situation, it was decided that the baselines for this variable should be "keyed" to GNP. In other words, if one were to pose the question "Why should the amount of long-term funds raised in the credit market differ among scenarios?" the most basic answer would be because the growth levels are markedly different.

To obtain the baselines long-term funds were regressed against GNP from 1947 to 1975. The equation estimated had an $\overline{R}^2$ of 0.71 which, although lower than other equations used, is still adequate. With this equation in hand the assumed future values of GNP in each scenario were put into the equation and projected out to the year 2000. These five baselines were then used in the TIA analysis.

REGRESSION EQUATION

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y) LTF
INDEPENDENT VARIABLE (X) GNP

NUMBER OF OBSERVATIONS 28
DETERMINAT OF THE INVERSE MATRIX 1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.8453	.35308E-02	.43765E-03	8.0675

REGRESSION INTERCEPT -13.568
MULTIPLE CORRELATION .84531
STD. ERROR OF ESTIMATE 6.8589
COEFF OF DETERMINATION .71455

```
FA1086
00010     1086   1950   1975   1976   2000   1976      14      0.000     100.000
00020  0.69341466                          0.03        -2.50
00030     1950          9.00          10.25
00040     1951         13.10          10.93
00050     1952         17.10          11.65
00060     1953         12.80          12.42
00070     1954         14.10          13.22
00080     1955         13.60          14.07
00090     1956         15.20          14.96
00100     1957         20.20          15.90
00110     1958         20.20          16.88
00120     1959         15.30          17.92
00130     1960         13.90          19.00
00140     1961         19.80          20.13
00150     1962         17.10          21.31
00160     1963         14.80          22.54
00170     1964         15.40          23.82
00180     1965         15.80          25.15
00190     1966         26.00          26.53
00200     1967         34.80          27.95
00210     1968         28.40          29.43
00220     1969         29.30          30.94
00230     1970         42.80          32.50
00240     1971         55.40          34.10
00250     1972         50.00          35.73
00260     1973         41.50          37.40
00270     1974         39.70          39.10
00280     1975         34.00          40.82
00290     1976          0.00          48.56
00300     1977          0.00          52.42
00310     1978          0.00          55.47
00320     1979          0.00          58.35
00330     1980          0.00          60.94
00340     1981          0.00          63.25
00350     1982          0.00          65.49
00360     1983          0.00          67.63
00370     1984          0.00          69.64
00380     1985          0.00          71.25
00390     1986          0.00          72.75
00400     1987          0.00          74.02
00410     1988          0.00          75.17
00420     1989          0.00          76.38
00430     1990          0.00          77.53
00440     1991          0.00          78.74
00450     1992          0.00          80.01
00460     1993          0.00          81.22
00470     1994          0.00          82.49
00480     1995          0.00          83.47
00490     1996          0.00          84.51
00500     1997          0.00          85.48
00510     1998          0.00          86.52
00520     1999          0.00          87.56
00530     2000          0.00          88.60
```

Baseline Scenario A (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA2086
00010     1086   1950   1975   1976   2000   1976      14       0.000     100.000
00020  0.69341466                          0.03          -2.50
00030     1950          9.00          10.25
00040     1951         13.10          10.93
00050     1952         17.10          11.65
00060     1953         12.80          12.42
00070     1954         14.10          13.22
00080     1955         13.60          14.07
00090     1956         15.20          14.96
00100     1957         20.20          15.90
00110     1958         20.20          16.88
00120     1959         15.30          17.92
00130     1960         13.90          19.00
00140     1961         19.80          20.13
00150     1962         17.10          21.31
00160     1963         14.80          22.54
00170     1964         15.40          23.82
00180     1965         15.80          25.15
00190     1966         26.00          26.53
00200     1967         34.80          27.95
00210     1968         28.40          29.43
00220     1969         29.30          30.94
00230     1970         42.80          32.50
00240     1971         55.40          34.10
00250     1972         50.00          35.73
00260     1973         41.50          37.40
00270     1974         39.70          39.10
00280     1975         34.00          40.82
00290     1976          0.00          48.56
00300     1977          0.00          54.26
00310     1978          0.00          58.93
00320     1979          0.00          63.71
00330     1980          0.00          68.66
00340     1981          0.00          73.56
00350     1982          0.00          78.69
00360     1983          0.00          84.04
00370     1984          0.00          89.63
00380     1985          0.00          95.51
00390     1986          0.00         102.13
00400     1987          0.00         109.11
00410     1988          0.00         116.42
00420     1989          0.00         124.43
00430     1990          0.00         132.78
00440     1991          0.00         141.60
00450     1992          0.00         151.22
00460     1993          0.00         161.30
00470     1994          0.00         171.96
00480     1995          0.00         183.14
00490     1996          0.00         194.89
00500     1997          0.00         207.28
00510     1998          0.00         220.30
00520     1999          0.00         234.01
00530     2000          0.00         248.41
```

Baseline Scenario B (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA3086
00010      1086   1950    1975    1976    2000    1976       14       0.000     100.000
00020     0.69341466                                  0.03          -2.50
00030      1950              9.00            10.25
00040      1951             13.10            10.93
00050      1952             17.10            11.65
00060      1953             12.80            12.42
00070      1954             14.10            13.22
00080      1955             13.60            14.07
00090      1956             15.20            14.96
00100      1957             20.20            15.90
00110      1958             20.20            16.88
00120      1959             15.30            17.92
00130      1960             13.90            19.00
00140      1961             19.80            20.13
00150      1962             17.10            21.31
00160      1963             14.80            22.54
00170      1964             15.40            23.82
00180      1965             15.80            25.15
00190      1966             26.00            26.53
00200      1967             34.80            27.95
00210      1968             28.40            29.43
00220      1969             29.30            30.94
00230      1970             42.80            32.50
00240      1971             55.40            34.10
00250      1972             50.00            35.73
00260      1973             41.50            37.40
00270      1974             39.70            39.10
00280      1975             34.00            40.82
00290      1976              0.00            48.56
00300      1977              0.00            54.26
00310      1978              0.00            58.93
00320      1979              0.00            63.71
00330      1980              0.00            68.66
00340      1981              0.00            73.44
00350      1982              0.00            78.46
00360      1983              0.00            83.64
00370      1984              0.00            89.17
00380      1985              0.00            94.82
00390      1986              0.00           101.15
00400      1987              0.00           107.84
00410      1988              0.00           114.75
00420      1989              0.00           122.36
00430      1990              0.00           130.31
00440      1991              0.00           138.60
00450      1992              0.00           147.71
00460      1993              0.00           157.27
00470      1994              0.00           167.24
00480      1995              0.00           177.78
00490      1996              0.00           188.84
00500      1997              0.00           200.42
00510      1998              0.00           212.63
00520      1999              0.00           225.42
00530      2000              0.00           238.85
```

Baseline Scenario C (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA5086
00010      1086   1950    1975    1976    2000    1976       14        0.000     100.000
00020     0.69341466                                  0.03          -2.50
00030      1950              9.00            10.25
00040      1951             13.10            10.93
00050      1952             17.10            11.65
00060      1953             12.80            12.42
00070      1954             14.10            13.22
00080      1955             13.60            14.07
00090      1956             15.20            14.96
00100      1957             20.20            15.90
00110      1958             20.20            16.88
00120      1959             15.30            17.92
00130      1960             13.90            19.00
00140      1961             19.80            20.13
00150      1962             17.10            21.31
00160      1963             14.80            22.54
00170      1964             15.40            23.82
00180      1965             15.80            25.15
00190      1966             26.00            26.53
00200      1967             34.80            27.95
00210      1968             28.40            29.43
00220      1969             29.30            30.94
00230      1970             42.80            32.50
00240      1971             55.40            34.10
00250      1972             50.00            35.73
00260      1973             41.50            37.40
00270      1974             39.70            39.10
00280      1975             34.00            40.82
00290      1976              0.00            48.56
00300      1977              0.00            54.25
00310      1978              0.00            58.52
00320      1979              0.00            62.38
00330      1980              0.00            66.82
00340      1981              0.00            70.97
00350      1982              0.00            75.00
00360      1983              0.00            79.09
00370      1984              0.00            83.41
00380      1985              0.00            87.85
00390      1986              0.00            92.17
00400      1987              0.00            96.60
00410      1988              0.00           101.27
00420      1989              0.00           106.05
00430      1990              0.00           110.49
00440      1991              0.00           115.10
00450      1992              0.00           119.88
00460      1993              0.00           124.78
00470      1994              0.00           129.79
00480      1995              0.00           134.97
00490      1996              0.00           140.33
00500      1997              0.00           145.80
00510      1998              0.00           151.51
00520      1999              0.00           157.33
00530      2000              0.00           163.32
```

Baseline Scenario R (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

To estimate the impact of this event a 10 percent capital shortage was assumed (i.e., long-term credit market funds fall by 10 percent). It is also assumed that if this occurred some short-term funds would be recategorized as long-term which reduces the shortage by 1 percent. This 9 percent impact was the figure used in the TIA analysis.

Event 55. Wage, Price, Profit, and Interest Rate Control Are Permanently Established.

This event was assumed to have three major influences. The first is to reduce risks associated with long-term lending. The second is to control inflation at some low acceptable level which then reduces the uncertainty associated with long-term investments. The third is to put a ceiling on the rate of return to long-term investments. The combination of these influences, the first two positive and the third negative, would have a small positive impact on the amount of long-term funds raised. The impact was set at 1 percent.

Event 151. Corporate Income Tax Rate Is Reduced by 50 Percent from 1975 Levels.

Corporations were assumed to spend 20 percent of the reduction in tax on investments (increasing internal funds). External long-term investment funds were assumed to fall by 80 percent of the decrease in tax. Since firms generated these funds internally it seems quite certain that need for external funds would decrease somewhat. The impact based on calculations using 1974, 1973, 1970, and 1965 figures was estimated at -4 percent.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget is Balanced on an Expenditure Basis.

Once again this event implies a withdrawal of sorts by government. The fact that the government balances its budget implies that government will borrow less in credit markets. This policy move by the Federal Government would decrease investor uncertainty as to subsequent monetary moves. The effect is positive in both cases and was assumed to boost long-term funds by 3 percent.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

This event will increase the amount of funds generated internally by corporations. It is assumed that since the firms have an increased supply of internal funds, there will be less demand for long-term external funds.

To calculate the impact, external long-term funds are assumed to decrease by 80 percent of the increase in depreciation allowances. On the average from 1972 to 1975 this would have resulted in a 3.6 percent decrease in long-term external funds, and this was the impact used.

Event 184. Corporate Profits Distributed as Dividends Are No Longer Taxed.

The increase in realized dividends by investors was assumed to be a windfall, and these investors re-invest the entire amount. In addition, since equity is now more attractive, external funds were increased by 1.5 percent of the windfall. These 2 impacts combined to increase long-term funds by 6 percent using 1972-1974 as the bases for calculation. This was the impact selected.

Event 185. In Order to Improve Municipal Finance Conditions, Federally Guaranteed Municipal Securities Are Established and Issued.

This event would eliminate completely the uncertainty which has been a significant factor in the municipal bond market. Thus investors who had supplied firms with long-term funds would switch out of equity and corporate bonds into the newly guaranteed municipals. It was assumed that the increased attractiveness (almost no risk) of municipals would result in a 2.5 percent increase in sales. This increase was subtracted from long-term funds and on a yearly basis averaged 1.5 percent of the yearly long-term funds' total from 1970 to 1975. This 1.5 percent was used as the impact in the TIA analysis.

```
00540   -19L.T. FUNDS RAISED IN THE CREDIT MARKET A
00550   -2  7777 4     53  1  3    -9.000  8    -4.000 1
00555    04    53    PP*    809000     *    101520
00560   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00585   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00610   -2  7777 4     55  1  3     1.000  6     0.500 1
00620    04    55    PP*    809000     *    308095
00630   104    55WAGE, PRICE, PROFIT AND INTEREST RATE CONTROLS
00640   114    55ARE PERMANENTLY ESTABLISHED.
00650   -2  7777 4    105  2  5     5.000 10     2.000 1
00660    04   105    PP*    809000     *    010510
00670   104   105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
00680   114   105SYSTEM IN A MAJORITY OF STATES.
00690   -2  7777 4    151  1  3    -4.000  8    -1.000 1
00700    04   151    PP*    809000     *    010101
00710   104   151CORPORATE INCOME TAX RATE IS REDUCED BY 50
00715   114   151PERCENT FROM 1975 LEVELS.
00720   -2  7777 4    152  2  4     3.000  8     1.000 1
00730    04   152    PP*    809000     *    010101
00750   104   152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00752   114   152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00754   124   152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00756   134   152MONETARY POLICY AS A DISCRETIONARY TOOL,
00758   144   152AND THE FEDERAL BUDGET IS BALANCED.
00760   -2  7777 4    182  1  2    -3.600  5    -1.200 1
00770    04   182    PP*    809000     *    010510
00780   104   182ACCELERATED DEPRECIATION ALLOWANCES ARE APPROVED
00786   114   182AND BECOME LAW (20 PERCENT INCREASE OVER 1975
00792   124   182LEVELS).
00800   -2  7777 4    183  1  2    -3.000  5    -0.500 1
00810    04   183    PP*    809000     *    606060
00820   104   183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%.
00825   114   183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
00830   -2  7777 4    184  1  4     6.000  9     2.000 1
00840    04   184    PP*    809000     *    010101
00850   104   184CORPORATE PROFIT DISTRIBUTED AS DIVIDENDS
00860   114   184ARE NO LONGER TAXED.
00870   -2  7777 4    185  1  4    -1.500  8    -0.500 1
00880    04   185    PP*    809000     *    506070
00890   104   185IN ORDER TO IMPROVE MUNICIPAL FINANCE CONDITIONS,
00900   114   185FEDERALLY GUARANTEED MUNICIPAL SECURITIES ARE
00901   124   185ESTABLISHED AND ISSUED.
00910   -2  7777 4    189  1  5    -1.000  8    -0.200 1
00920    04   189    PP*    809000     *    051520
00930   104   189THE AMOUNT OF MORTGAGE DEBT OUTSTANDING HELD
00940   114   189BY FEDERAL AND RELATED AGENCIES DOUBLES (1975 -
00950   124   189$88.1 BILLION).
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Final Sales of Goods as a Percent of Total Final Sales

BASELINE

This indicator was included in the scenarios to act as a proxy for the trend toward a service-oriented economy. Historically, as the U.S. economy has grown there has been a shift away from a manufacturing base toward more services. In 1947 goods output was approximately 60 percent of final output (GNP); by 1975 goods output had fallen to about 45 percent of final output.

A regression approach was tried in deriving the baselines, but due to the extremely rapid growth in Scenarios B and C the extrapolated results were not satisfactory (e.g., the percentage of goods output in Scenario B fell to less than 4 percent). Nonetheless, there did appear a strong need for separate baselines for this indicator since the growth trends seem to be the major causative factor in the behavior of this indicator.

It was decided to obtain growth rates (or in this case negative growth rates) by using a simple ratio approach. GNP grew at an annual rate of 3.5 percent from 1947 through 1975 while percent of goods output fell at an average rate of 1.1 percent. Since the future growth rates for GNP in each of the scenarios are given, a simple ratio equation was derived.

$$\frac{\text{historic growth rate of goods output}}{\text{historic growth rate of GNP}} = \frac{\text{growth rate of goods output in each scenario}}{\text{annual growth rate of GNP in each scenario}}$$

or

$$\frac{1.1}{3.5} = \frac{X}{\text{GNP growth rate}}$$

where X is the estimate of the growth rate of the percentage of goods output.

Using this ratio approach, growth rates were obtained for each of the scenarios. Since this indicator should display asymptotic behavior as there will always be some minimum production of goods, each of the derived growth rates were reduced by one-third. The final growth rates were

Scenario A	-0.335
Scenario B	-1.100
Scenario C	-1.000
Scenario D	-0.382
Scenario R	-0.740

These growth rates were applied to the 1975 base figure and compounded to yield five baselines out to the year 2000.

```
FA1083
00010      1083   1950    1975    1976    2000    1976        3        0.000     100.000
00020   0.94225763                                 -0.48              2.55
00030      1950            54.60           55.76
00040      1951            54.60           55.23
00050      1952            55.70           54.71
00060      1953            55.80           54.21
00070      1954            54.40           53.73
00080      1955            52.80           53.26
00090      1956            52.60           52.80
00100      1957            52.90           52.35
00110      1958            51.90           51.91
00120      1959            50.50           51.49
00130      1960            50.80           51.07
00140      1961            50.00           50.67
00150      1962            49.70           50.27
00160      1963            49.50           49.89
00170      1964            49.50           49.51
00180      1965            49.30           49.14
00190      1966            49.10           48.78
00200      1967            49.20           48.43
00210      1968            48.80           48.09
00220      1969            48.30           47.75
00230      1970            47.70           47.42
00240      1971            46.50           47.10
00250      1972            46.30           46.78
00260      1973            48.00           46.47
00270      1974            45.30           46.17
00280      1975            45.20           45.87
00290      1976             0.00           45.00
00300      1977             0.00           45.90
00310      1978             0.00           44.70
00320      1979             0.00           44.60
00330      1980             0.00           44.40
00340      1981             0.00           44.30
00350      1982             0.00           44.20
00360      1983             0.00           44.00
00370      1984             0.00           43.90
00380      1985             0.00           43.70
00390      1986             0.00           43.60
00400      1987             0.00           43.40
00410      1988             0.00           43.30
00420      1989             0.00           43.10
00430      1990             0.00           43.00
00440      1991             0.00           42.80
00450      1992             0.00           42.70
00460      1993             0.00           42.60
00470      1994             0.00           42.40
00480      1995             0.00           42.30
00490      1996             0.00           42.10
00500      1997             0.00           42.00
00510      1998             0.00           41.80
00520      1999             0.00           41.70
00530      2000             0.00           41.60
```

Baseline Scenario A (percent)

(See p. 2.4 for key to the data.)

```
FA2083
00010      1083   1950    1975    1976    2000    1976        3        0.000      100.000
00020  0.94225763                                  -0.48          2.56
00030      1950          54.60          55.76
00040      1951          54.60          55.23
00050      1952          55.70          54.71
00060      1953          55.80          54.21
00070      1954          54.40          53.73
00080      1955          52.80          53.26
00090      1956          52.60          52.80
00100      1957          52.90          52.35
00110      1958          51.90          51.91
00120      1959          50.50          51.49
00130      1960          50.80          51.07
00140      1961          50.00          50.67
00150      1962          49.70          50.27
00160      1963          49.50          49.89
00170      1964          49.50          49.51
00180      1965          49.30          49.14
00190      1966          49.10          48.78
00200      1967          49.20          48.43
00210      1968          48.80          48.09
00220      1969          48.30          47.75
00230      1970          47.70          47.42
00240      1971          46.50          47.10
00250      1972          46.30          46.78
00260      1973          48.00          46.47
00270      1974          45.30          46.17
00280      1975          45.20          45.87
00290      1976           0.00          44.7
00300      1977           0.00          44.20
00310      1978           0.00          43.70
00320      1979           0.00          43.20
00330      1980           0.00          42.80
00340      1981           0.00          42.30
00350      1982           0.00          41.80
00360      1983           0.00          41.40
00370      1984           0.00          40.90
00380      1985           0.00          40.50
00390      1986           0.00          40.00
00400      1987           0.00          39.60
00410      1988           0.00          39.10
00420      1989           0.00          38.70
00430      1990           0.00          38.30
00440      1991           0.00          37.90
00450      1992           0.00          37.40
00460      1993           0.00          37.00
00470      1994           0.00          36.60
00480      1995           0.00          36.20
00490      1996           0.00          35.80
00500      1997           0.00          35.40
00510      1998           0.00          35.00
00520      1999           0.00          34.70
00530      2000           0.00          34.30
```

Baseline Scenario B (percent)

(See p. 2.4 for key to the data.)

```
FA3083
00010      1083   1950   1975   1976   2000   1976        3        0.000      100.000
00020    0.94225763                              -0.48          2.56
00030      1950          54.60          55.76
00040      1951          54.60          55.23
00050      1952          55.70          54.71
00060      1953          55.80          54.21
00070      1954          54.40          53.73
00080      1955          52.80          53.26
00090      1956          52.60          52.80
00100      1957          52.90          52.35
00110      1958          51.90          51.91
00120      1959          50.50          51.49
00130      1960          50.80          51.07
00140      1961          50.00          50.67
00150      1962          49.70          50.27
00160      1963          49.50          49.89
00170      1964          49.50          49.51
00180      1965          49.30          49.14
00190      1966          49.10          48.78
00200      1967          49.20          48.43
00210      1968          48.80          48.09
00220      1969          48.30          47.75
00230      1970          47.70          47.42
00240      1971          46.50          47.10
00250      1972          46.30          46.78
00260      1973          48.00          46.47
00270      1974          45.30          46.17
00280      1975          45.20          45.87
00290      1976           0.00          44.70
00300      1977           0.00          44.30
00310      1978           0.00          43.90
00320      1979           0.00          43.40
00330      1980           0.00          43.00
00340      1981           0.00          42.60
00350      1982           0.00          42.10
00360      1983           0.00          41.70
00370      1984           0.00          41.30
00380      1985           0.00          40.90
00390      1986           0.00          40.50
00400      1987           0.00          40.10
00410      1988           0.00          42.48
00420      1989           0.00          39.30
00430      1990           0.00          38.90
00440      1991           0.00          38.50
00450      1992           0.00          38.10
00460      1993           0.00          37.70
00470      1994           0.00          37.30
00480      1995           0.00          37.00
00490      1996           0.00          36.60
00500      1997           0.00          36.20
00510      1998           0.00          35.90
00520      1999           0.00          35.50
00530      2000           0.00          35.20
```

Baseline Scenario C (percent)

(See p. 2.4 for key to the data.)

```
FA4083
00010     1083   1950    1975    1976    2000    1976        3       0.000     100.000
00020    0.94225763                              -0.48          2.56
00030    1950            54.60           55.76
00040    1951            54.60           55.23
00050    1952            55.70           54.71
00060    1953            55.80           54.21
00070    1954            54.40           53.73
00080    1955            52.80           53.26
00090    1956            52.60           52.80
00100    1957            52.90           52.35
00110    1958            51.90           51.91
00120    1959            50.50           51.49
00130    1960            50.80           51.07
00140    1961            50.00           50.57
00150    1962            49.70           50.27
00160    1963            49.50           49.89
00170    1964            49.50           49.51
00180    1965            49.30           49.14
00190    1966            49.10           48.78
00200    1967            49.20           48.43
00210    1968            48.80           48.09
00220    1969            48.30           47.75
00230    1970            47.70           47.42
00240    1971            46.50           47.10
00250    1972            46.30           46.78
00260    1973            48.00           46.47
00270    1974            45.30           46.17
00280    1975            45.20           45.87
00290    1976             0.00           45.00
00300    1977             0.00           44.90
00310    1978             0.00           44.70
00320    1979             0.00           44.50
00330    1980             0.00           44.30
00340    1981             0.00           44.20
00350    1982             0.00           44.00
00360    1983             0.00           43.80
00370    1984             0.00           43.70
00380    1985             0.00           43.50
00390    1986             0.00           43.30
00400    1987             0.00           43.20
00410    1988             0.00           43.00
00420    1989             0.00           42.90
00430    1990             0.00           42.70
00440    1991             0.00           42.50
00450    1992             0.00           42.40
00460    1993             0.00           42.20
00470    1994             0.00           42.00
00480    1995             0.00           41.90
00490    1996             0.00           41.70
00500    1997             0.00           41.50
00510    1998             0.00           41.30
00520    1999             0.00           41.20
00530    2000             0.00           41.10
```

Baseline Scenario D (percent)

(See p. 2.4 for key to the data.)

```
FA5083
00010      1083   1950    1975    1976    2000    1976        3        0.000     100.000
00020    0.94225763                                -0.48              2.56
00030    1950           54.60           55.76
00040    1951           54.60           55.23
00050    1952           55.70           54.71
00060    1953           55.80           54.21
00070    1954           54.40           53.73
00080    1955           52.80           53.26
00090    1956           52.60           52.80
00100    1957           52.90           52.35
00110    1958           51.90           51.91
00120    1959           50.50           51.49
00130    1960           50.80           51.07
00140    1961           50.00           50.67
00150    1962           49.70           50.27
00160    1963           49.50           49.89
00170    1964           49.50           49.51
00180    1965           49.30           49.14
00190    1966           49.10           48.78
00200    1967           49.20           48.43
00210    1968           48.80           48.09
00220    1969           48.30           47.75
00230    1970           47.70           47.42
00240    1971           46.50           47.10
00250    1972           46.30           46.78
00260    1973           48.00           46.47
00270    1974           45.30           46.17
00280    1975           45.20           45.87
00290    1976            0.00           44.90
00300    1977            0.00           44.50
00310    1978            0.00           44.20
00320    1979            0.00           43.90
00330    1980            0.00           43.60
00340    1981            0.00           43.20
00350    1982            0.00           42.90
00360    1983            0.00           42.60
00370    1984            0.00           42.30
00380    1985            0.00           42.00
00390    1986            0.00           41.70
00400    1987            0.00           41.30
00410    1988            0.00           41.00
00420    1989            0.00           40.70
00430    1990            0.00           40.40
00440    1991            0.00           40.10
00450    1992            0.00           39.80
00460    1993            0.00           39.50
00470    1994            0.00           39.30
00480    1995            0.00           39.00
00490    1996            0.00           38.70
00500    1997            0.00           39.40
00510    1998            0.00           38.10
00520    1999            0.00           37.8(
00530    2000            0.00           37.5
```

Baseline Scenario R cent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

This event would definitely cause a rise in prices of raw materials. This would be achieved either through direct price increases or through reductions in supply which in turn would lead to price increases. In any case, those goods (probably most durable goods) which use these raw materials for inputs would rise relative to other economic goods (i.e., services and some non-durables). This relative price rise would cause a shift in demand which is estimated to reduce the goods percent by 2.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

The capital shortage is assumed to be 10 percent. This would cause the interest rate to rise, and capital spending would fall, most likely causing some reduction in output. Since the output of durable goods is more affected by cyclical behavior than are services and non-durables, goods production overall should fall. These two forces, reduced capital spending and some cyclical downturn in durable goods, would combine to reduce the goods percent by 2.

Event 56. One-Half of Consumer Durables Are Fabricated Using Recycled Materials.

There are two basic impacts of this event. The first is that there would be a significant amount of capital spending to reclaim the recycled materials. The second is that the prices of these fabricated goods must be lower or else the production would not have taken place. So the relative price decrease in these durable goods and the capital spending implied would raise the goods percent by an estimated 0.9.

Event 63. R&D Spending in the United States Increases from the Mid-1970's Level of 2.5 Percent of GNP to 5 Percent of GNP.

The long-term impact of this event would be to increase productivity. With increased productivity the same quantity of inputs should in effect produce more goods. Or perhaps the increase in R&D would result in better goods at lower real prices. In any case, the impact of this event on goods percent is quite small and was estimated at 0.7 percent.

Event 77. Congress Enacts a New Tax on Goods and Services Proportional to Their Environmental Impact, Allocating These Funds for Environmental Improvements.

It was assumed for this event that the production and consumption of goods has a greater environmental impact than services. If this is in fact true then the prices of goods (including the tax) would rise relative to other prices. This increase in relative price would cut down on their production and consumption. The impact, small but significant, was estimated at -1 percent.

Event 97. Middle-Class Attitudes Toward Work Are Challenged by the Rise of Strong Avocational Interests.

This event implies that there is a trend away from materialism toward a life-style which concentrates more on non-resource consuming activities. There is still a drive toward personal satisfaction but not through the consumption of more goods. The impact was assumed to be a 2 percent decrease in the goods percent.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations and Stable Export Earnings for Producing Nations.

This event implies that the United States will have few or no supply interruptions in the future. In addition there is no need to build large, expensive extraction facilities since non-domestic supplies are stabilized. The agreement would most likely result in somewhat higher prices. These effects combine to cause a slight decline in the goods percent, estimated at -0.4.

Event 182. Accelerated Depreciation Allowances Are Approved and Become Law (20 Percent Increase over 1975 Levels).

This event would tend to boost business expenditures for new plant and equipment. Even, however, if all the funds raised by the increase in depreciation allowances were spent on capital goods, the maximum impact on the percentage of goods is only approximately 0.5 percent. This was the impact used.

```
00540   -19PERCENT OF OUTPUT ORIGINATING IN MANUFACTURING -"A"
00550   -2  7777 4      29  1 10     -3.000 15      1.000 1
00560    04    29    PP*     809000     *     015060
00570   104    29CAR LIFETIMES ARE EXTENDED TO DOUBLE 1975
00580   114    29EXPECTED VALUES.
00590   -2  7777 4      51  1  5     -2.000 10     -0.500 1
00600    04    51    PP*     809000     *     257090
00610   104    51    S COUNTRIES FORM CARTELS FOR KEY RAW
00626   114    51    BAUXITE, MANGANESE, TIN AND
00642   124    51(
00660   -2  7777 4      53  1  4     -2.000  8     -0.500 1
00670    04    53    PP*     809000     *     101520
00680    04    53    PP*     809000     *     101520
00693   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00706   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00720   -2  7777 4      56  1  3      0.900  6      0.300 1
00730    04    56    PP*     809000     *     014060
00740   104    56ONE-HALF OF CONSUMER DURABLES ARE FABRICATED
00745   114    56USING RECYCLED MATERIALS.
00750   -2  7777 4      63  5 10      0.700 15      0.100 1
00760    04    63    PP*     809000     *     102030
00770   104    63R&D SPENDING IN THE U.S. INCREASES FROM THE MID
00780   114    631970'S LEVEL OF 2.5 PERCENT OF GNP TO 5
00781   124    63PERCENT OF GNP.
00790   -2  7777 4      77  1  4     -1.000  8     -0.200 1
00800    04    77    PP*     809000     *     304060
00810   104    77CONGRESS ENACTS A NEW TAX ON GOODS AND SERVICES
00820   114    77PROPORTIONAL TO THEIR ENVIRONMENTAL IMPACT,
00830   124    77ALLOCATING THESE FUNDS FOR ENVIRONMENTAL
00840   134    77IMPROVEMENTS.
00650   -2  7777 4      97  1  6     -2.000 10     -0.500 1
00860    04    97    PP*     809000     *     106080
00870   104    97MIDDLE CLASS ATTITUDES TOWARDS WORK ARE
00880   114    97CHALLENGED BY THE RISE OF STRONG
00890   124    97AVOCATIONAL INTERESTS.
00900   -2  7777 4     182  1  3      0.500  7      0.100 1
00910    04   182    PP*     809000     *     010510
00920   104   182ACCELERATED DEPRECIATION ALLOWANCES ARE APPROVED
00930   114   182AND BECOME LAW (20 PERCENT INCREASE OVER 1975
00940   124   182LEVELS).
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Average Revenues Per Kilowatt-Hour, All Sectors

BASELINE

A fit to data for the past 25 years gives projections that, following the historic trend, continue the decline in the price of electricity. Utilities have operated in a substantially different environment in recent years when they have been faced with escalating costs for capital equipment, for fuel, and for environmental control. Uncertainties over siting and fuel supply have seriously impacted utility planning.

It was felt that the increases in the price of electricity realized since 1970 were representative of the future nature of utility economics. A straight-line fit, while giving a low R^2 of 0.67, resulted in an acceptable projection for at least the next decade. While some foresee a leveling off in the period beyond 1985, the projected value for the year 2000 does not exceed a reasonable value.

The price of electricity has been rising since 1970, principally because of increased fuel costs, interest charges, and operating costs. While a future stabilized economy may be expected to slow the rate of growth of these factors, further increases in electric rates will be brought about by increased capital costs particularly for nuclear plant and for pollution-control equipment. Fuel costs must still be considered uncertain and will continue to exert a pressure on electric prices. On the balance, however, the outlook is for a slower rate of increase in the price of electricity than in the period 1970-1975. The straight-line extrapolation indicates a moderate increase in electricity price and that future economic circumstances will produce a smaller percentage impact on electric utility revenues.

```
FA1006
00010     1006   1970    1975   1976    2000   1976        1        0.000        5.000
00020  0.65724084                                0.04        -0.11
00030  1970              2.47              2.47
00040  1971              2.54              2.51
00050  1972              2.57              2.55
00060  1973              2.53              2.58
00070  1974              2.56              2.62
00080  1975              2.72              2.66
00090  1976              0.00              2.69
00100  1977              0.00              2.73
00110  1978              0.00              2.77
00120  1979              0.00              2.80
00130  1980              0.00              2.84
00140  1981              0.00              2.88
00150  1982              0.00              2.92
00160  1983              0.00              2.95
00170  1984              0.00              2.99
00180  1985              0.00              3.03
00190  1986              0.00              3.06
00200  1987              0.00              3.10
00210  1988              0.00              3.14
00220  1989              0.00              3.17
00230  1990              0.00              3.21
00240  1991              0.00              3.25
00250  1992              0.00              3.28
00260  1993              0.00              3.32
00270  1994              0.00              3.36
00280  1995              0.00              3.40
00290  1996              0.00              3.43
00300  1997              0.00              3.47
00310  1998              0.00              3.51
00320  1999              0.00              3.54
00330  2000              0.00              3.58
```

Baseline (constant 1975 cents/kw-hr)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 34. The Atlantic Outercontinental Shelf Produces 1 Million Barrels of Oil per Day.

Successful exploitation of the Atlantic OCS will be a strong indication of the determination of the United States to exert leverage on the price of imported oil through the development of domestic sources. It is also assumed that coal is maintained in the same competitive position with oil and that a drop in oil price indicates a drop in total fossil fuel costs. If fossil fuels in the 1980's contribute 60 percent to electrical generation inputs and fuel costs account for about 30 percent of electricity price, and it is assumed that the occurrence of the event results in the decline of oil prices by 25 percent and that this is ultimately followed by similar competitive adjustments in coal prices, the impact on electricity price will be about a 5 percent reduction. A relatively long time period is assumed to realize the reduction in oil prices as maximum production levels are achieved and the time to maximum impact is taken to be one decade.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investments of Industry.

The electric utility industry can be expected to be particularly sensitive to this event since its capital requirements in relation to revenues are very large. The occurrence of this event will drive interest rates up very high and force utilities to use old equipment rather than retire it. If this event increases both capital costs and operating and maintenance costs by 50 percent and if both of these contribute approximately 50 percent to the total price of electricity, there will be a total increase of 25 percent. Regulatory adjustments, however, will undoubtedly ease the impact of the event. A 20 percent increase is judged to be the maximum impact due to this event, with the years to maximum impact being approximately equal to the lead time for the development of the new plant.

Event 59. Publicly Owned Petroleum Company Is Established that Supplies 20 Percent of the Domestic Market.

A major purpose for creating such a company is to provide fuel at a lower cost than would otherwise prevail. Oil prices are assumed to be reduced by 10 percent under the competitive stimulus of a public oil company. As reasoned in Event 34, if this indicates a similar decline in coal prices, the price of electricity will decline by about 2 percent. An oil-price drop would be felt within the few years it would take to establish the large market share for the national oil company, and five years were taken to maximum impact.

Event 67. Prices of All Prime Energy Sources Are Totally Deregulated.

It is assumed that the prices of all fuels will rise by 30 percent. If fuel costs account for about 30 percent of the total electrical price, the impact on electrical price will be nearly a 10-percent increase. The maximum impact would be felt very quickly after the implementation of the event, and two years to maximum impact have been assumed.

Event 100. Coal Production Fails to Reach Projected Levels Because of Labor Problems and Adequate Transportation and Environmental Constraints.

For this event a shortage of 200 million tons has been assumed out of an expected 1 billion tons per year for the 1980's projected by the FEA ("Coal," Project Independence, Federal Energy Administration, November 1974). Occurrence of this event means that energy inputs of 2.5 million barrels of oil per day equivalent will be required to make up for the deficit. On the assumption that fossil fuel prices would increase 15 percent and that fossil fuels in the 1980's account for 60 percent of electrical fuel inputs and that 30 percent of electricity prices is fuel cost, the impact on the price of electricity will be an almost 3-percent rise. The problems suggested by the event are assumed to be resolved after several years, and the effect on electricity price is ultimately reduced to zero.

Event 153. Costs for Electric System Equipment Accelerate at 10 Percent Above the General Inflation Rate.

The impact of this event will be to increase capital costs for electric system equipment as a result of an increasing demand for such equipment and also as a result of the increasing sophistication required for such equipment. If electrical system costs amount to 50 percent of the price of electricity, this would result in a net 5 percent increase in electric prices.

Event 154. Industry Difficulties and Foreign Pressures Force the Price of Fossil Energy to Rise to the Oil Equivalent of $20 per Barrel in Real Terms.

This is a near doubling of the price of energy over current levels. If fossil fuels amount to 60 percent of electrical inputs and fuel costs account for 30 percent of the price of electricity, this event will result in approximately a 20 percent increase in the price of electricity. This price change will take place rather rapidly within a few years following the dislocating circumstances suggested in the event.

Event 171. OPEC Dissolves.

OPEC dissolution will result in a large drop in foreign oil prices, and this will put great pressure on domestic oil and coal prices. If the subsequent net reduction in fossil fuel prices is 25 percent, if fossil fuels in the 1980's contribute 60 percent to electrical generation inputs, and if fossil fuels account for 30 percent of electrical prices, the impact of the event on electricity price will be to reduce it by nearly 5 percent. It may be expected, however, that this erosion of all fossil fuel prices will develop over a substantially long time interval, and 10 years was assigned for maximum impact.

```
00340   -19AVERAGE PRICE OF ELECTRICITY-ALL SECTORS   -  SCENARIO "A"
00350   -2  7777 4      32  5 10      5.000 10      5.000 1
00360    04    32    PP*     809000     *     054050
00370   104    32DOMESTIC URANIUM SUPPLIES FALL 25 PERCENT
00380   114    32SHORT OF REQUIREMENTS.
00390   -2  7777 4      33  5 15     -2.000 15     -2.000 1
00400    04    33    PP*     809000     *     052030
00410   104    33PRODUCTION REACHES 1/2 MILLION BARRELS A DAY
00420   114    33OF SHALE OIL.
00430   -2  7777 4      34  3 10     -5.000 10     -5.000 1
00440    04    34    PP*     809000     *     012025
00450   104    34THE ATLANTIC OUTER CONTINENTAL SHELF PRODUCES
00460   114    341 MILLION BARRELS OF OIL PER DAY.
00470   -2  7777 4      35  3 10     -2.000 10     -2.000 1
00480    04    35    PP*     809000     *     013540
00490   104    35SOLAR ENERGY, REFUSE BURNING, AND GEOTHERMAL POWER
00500   114    35CONSTITUTE 3-4 PERCENT OF THE TOTAL U.S.
00510   124    35ENERGY REQUIREMENTS ANNUALLY.
00520   -2  7777 4      44  5 20     -5.000 20     -5.000 1
00530    04    44    PP*     809000     *     011015
00540   104    44A NATIONAL ELECTRICAL ENERGY GRID IS IMPLEMENTED.
00550   -2  7777 4      53  3  7     20.000  7     20.000 1
00560    04    53    PP*     809000     *     101520
00570   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00580   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
00590   -2  7777 4      59  2  5     -2.000  5     -2.000 1
00600    04    59    PP*     809000     *     052030
00610   104    59A PUBLICLY OWNED PETROLEUM COMPANY IS ESTABLISHED
00620   114    59WHICH SUPPLIES 20 PERCENT OF THE DOMESTIC
00630   124    59MARKET.
00640   -2  7777 4      67  1  2     10.000  5     10.000 1
00650    04    67    PP*     809000     *     010510
00660   104    67THE PRICES OF ALL PRIME ENERGY SOURCES ARE TOTALLY
00670   114    67DEREGULATED.
00680   -2  7777 4      82  1  2      5.000  2      5.000 1
00690    04    82    PP*     809000     *     306070
00700   104    82A PROGRESSIVE TAX IS IMPOSED ON ALL ENERGY
00710   114    82USAGE WITH THE PROCEEDS FUNNELED INTO ENERGY
00720   124    82PRODUCTION AND CONSERVATION R&D PROGRAMS.
00730   -2  7777 4      88  5 10      7.000 10      7.000 1
00740    04    88    PP*     809000     *     204050
00750   104    88A NUCLEAR MORATORIM IS CALLED IN NEW CONSTRUCTION
00760   114    88WITH A COMPLETE RE-EVALUATION OF NUCLEAR POWER
00770   124    88GENERATION.
00780   -2  7777 4     100  2  4      3.000  7      0.000 1
00790    04   100    PP*     809000     *     105050
00800   104   100COAL PRODUCTION FAILS TO REACH PROJECTED LEVELS
00810   114   100BECAUSE OF LABOR PROBLEMS, INADEQUATE TRANSPORTA-
00820   124   100TION, AND ENVIRONMENTAL CONSTRAINTS.
00850   -2  7777 4     153  2  5      5.000  5      5.000 1
00860    04   153    PP*     809000     *     102025
00870   104   153COSTS FOR ELECTRIC SYSTEM EQUIPMENT ACCELERATE
00880   124   153AT 10 PERCENT ABOVE THE GENERAL INFLATION RATE.

00890   -2  7777 4     154  1  4     20.000 14     10.000 1
00900    04   154    PP*     809000     *     003040
00910   104   154INDUSTRY DIFFICULTIES AND FOREIGN PRESSURES
00920   114   154FORCE THE PRISE OF FOSSIL ENERGY TO RISE TO THE
00930   124   154OIL EQUIVALENT OF $20 PER BARREL IN REAL TERMS.
00950   -2  7777 4     171  2 10     -5.000 10     -5.000 1
00960    04   171    PP*     809000     *     051520
00970   104   1710PEC DISSOLVES
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to data.)

Ratio of Domestic Production of Crude Oil, Lease Condensate, and Natural Gas Liquids to Domestic Demand for Refined Products

BASELINE

The historic values for the ratio are fitted well by the baseline ($R^2 = 0.90$). The ratio has been decreasing monotonically at an accelerating rate. New domestic oil supply growth rates have declined since the 1950's as cheap foreign oil imports expanded to meet growing demand. If the economics of the oil industry continue to inhibit domestic production while oil demand continues to grow at its historically high rate, dependency on foreign oil supplies will greatly increase. The sharp rise of oil prices in this last half decade has not significantly changed the ratio by either stimulating production or attenuating demand. It can be assumed, therefore, that continuation of present energy economics will not exert any leverage on the foreign oil demand.

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FA1008
00010      1008   1950    1975    1976    2000    1976       14        0.000      100.000
00020     0.89457412                                 -0.04              2.94
00030     1950            90.08           93.18
00040     1951            95.10           92.63
00050     1952            94.19           92.04
00060     1953            93.48           91.41
00070     1954            90.20           90.74
00080     1955            89.53           90.01
00090     1956            90.52           89.24
00100     1957            90.38           88.41
00110     1958            82.44           87.53
00120     1959            83.26           86.59
00130     1960            81.28           85.59
00140     1961            81.93           84.54
00150     1962            80.31           83.42
00160     1963            80.42           82.23
00170     1964            79.55           80.98
00180     1965            78.29           79.66
00190     1966            79.26           78.28
00200     1967            81.36           76.83
00210     1968            79.13           75.32
00220     1969            76.59           73.73
00230     1970            76.87           72.09
00240     1971            73.33           70.38
00250     1972            68.33           68.62
00260     1973            63.24           66.80
00270     1974            62.83           64.92
00280     1975            61.34           63.00
00290     1976             0.00           61.04
00300     1977             0.00           59.04
00310     1978             0.00           57.02
00320     1979             0.00           54.96
00330     1980             0.00           52.89
00340     1981             0.00           50.81
00350     1982             0.00           48.73
00360     1983             0.00           46.65
00370     1984             0.00           44.59
00380     1985             0.00           42.54
00390     1986             0.00           40.52
00400     1987             0.00           38.53
00410     1988             0.00           36.57
00420     1989             0.00           34.66
00430     1990             0.00           32.80
00440     1991             0.00           30.99
00450     1992             0.00           29.24
00460     1993             0.00           27.55
00470     1994             0.00           25.92
00480     1995             0.00           24.35
00490     1996             0.00           22.85
00500     1997             0.00           21.41
00510     1998             0.00           20.04
00520     1999             0.00           18.74
00530     2000             0.00           17.51
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 11. Use of Telecommunication Reduces the Amount of All Travel by 20 Percent.

Transportation accounts for 50 percent of domestic petroleum production. Passenger travel consumes 75 percent of all transportation fuel. A 20 percent reduction in the fuel demand for travel would mean a nearly 8 percent decrease in total petroleum consumption. Assuming that domestic production remains constant, there will be an 8 percent increase in the variable.[4] This impact would develop slowly as increasing preferences for travel are altered.

Event 23. Synthetic Gas from Coal Is Commercially Available.

Pipeline gas from coal is projected to reach approximately 1 million barrels oil equivalent per day in 1980. ("Synthetic Fuels from Coal," Project Independence, Federal Energy Administration [November 1974], pp. 106-107.) Assuming consumption of 20 million barrels of oil per day and that all of the gas substitutes for oil, the impact would raise the indicator 5 percent. From the point of introduction of a feasible synthetic process, additional plants will be expected to grow as natural gas supplies become tighter and, therefore, the steady state impact is increased to 10 percent.

Event 34. The Atlantic Outer Continental Shelf Produces 1 Million Barrels of Oil Per Day.

The 1990 baseline projection for the ratio of domestic petroleum produced to total consumption is about one-third. Assuming 20 million barrels of oil per day are consumed, domestic production will be nearly 7 million barrels per day. If the OCS supplies 1 million barrels a day of oil, the increase in the indicator will be nearly 15 percent.

Event 40. Coal and Nuclear Stations Contribute 75 Percent of Electrical Energy.

The occurrence of this event will greatly reduce the use of oil for electrical generation. The percentage of total oil represented by electrical inputs has been approximately 10 percent in the 1970's and has been projected to rise to 15-20 percent unless coal and nuclear sources for electrical generation are vigorously developed. The occurrence of the event will keep oil demand for electrical production to below the 1970's level, resulting in a potential drop of about 10 percent in consumption and, therefore, an increase of about 10 percent in the variable.

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4 In estimating impacts, changes in production or demand are assumed not to affect one another so that the percent change in either production or demand is equal to the percent change in their ratio.

Event 42. Non-Petroleum Sources of Primary Power for Ground Transportation (Storage Batteries, Fuel Cells, Electromagnetic Propulsion, and the Like) Account for One-Quarter of the Transportation Energy Demand.

About 50 percent of domestic petroleum is consumed by transportation which is 95 percent petroleum dependent. A 25 percent reduction in transportation oil would imply about a 12 percent decrease in total petroleum consumption. It is assumed that nearly half this saving would be needed by the electric utilities in energizing these new sources. The impact was, therefore, estimated at a 5 percent saving in total oil consumption, growing gradually to 7 percent as coal or nuclear capacity is brought on-line.

Event 45. A National Program for Raw Material Resource Rationing Is Established.

The effect of this event is to decrease oil consumption. A nominal increase in the indicator of 5 percent would mean a decrease of 1 million barrels per day. The program is assumed to be implemented in one year with its full effect realized in two years.

Event 47. More than 10,000 Miles of the Interstate Highway System Are Electrified and Automated to Accommodate Dual-Mode Automobiles.

This amount of mileage represents almost one-quarter of the interstate system and would likely be near metropolitan centers. Automobiles consume more than 55 percent of transportation energy (roughly 50 percent in urban areas). Assuming one-quarter of the interstate traffic and one-half of the urban traffic is equipped for and uses electrified highways, potential savings of oil would amount to 8 percent. But because electric utilities will use increased oil to meet this additional demand, the savings was assumed to be 3 percent, growing to 5 percent as utilities convert to coal and nuclear energy.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

It is expected that the impact of this event will be heavily felt on the oil production industry. The economic instability this event suggests will aggravate the conservative attitudes of the oil industry toward domestic expansion. The maximum impact will develop slowly as the consequences of the event are felt throughout the economy, and a decrease of 10 percent was assigned to the variable.

Event 57. $10 Billion Per Year of Government Funds Are Devoted to Urban Transit System Development (Approximately $2 Billion in 1974).

A quintupling of funding for transit will modernize existing systems and underwrite new systems of public transportation, thus leading to a more favorable (greater than 5 percent) modal split. However, it is assumed that expenditure on highway systems remained at a rate in excess of $100 billion per year and that most transit systems will be buses, so only a slight reduction (2 percent) in oil consumption will accrue. As the expenditure rate

for transit is maintained, public acceptance will grow and a somewhat greater (4 percent) reduction in oil consumption is assumed.

Event 82. A Progressive Tax is Imposed on All Energy Usage with the Proceeds Funneled into Energy Production Conservation R&D Programs.

The effect of this event would be to reduce petroleum consumption. Price elasticity for the various consuming sectors is conjectural. A nominal decrease in consumption of 5 percent was judged to be not unreasonable, implying a 5 percent increase in the variable. Such an impact could be seen within the few years it would take to establish this kind of a program.

Event 89. Federal Funds Are Withheld in Order to Stop Urban Expressway Construction.

This measure will enhance the attractiveness of public transportation as a high capacity alternative to auto congestion of the urban area. Since transit is three to four times as efficient on a per-passenger-mile basis, fuel consumption will be reduced. However, motorists will be reluctant to abandon the convenience of the auto, and those who do not will be consuming even more fuel in stop-and-go driving. The net effect of this event has been assumed to be a savings of only 3 percent.

Event 100. Coal Production Fails to Reach Projected Levels Because of Labor Problems, Inadequate Transportation, and Environmental Constraints.

For this event it is assumed that coal production fails by 20 percent or 200 million tons per year out of the 1 billion tons per year projected for the mid-1980's by the FEA ("Coal," Project Independence, Federal Energy Administration [November 1974], p. 38). The FEA projection suggests oil consumption in the 1980's to be 24 million barrels per day. Since nuclear energy cannot respond to the transient posed by the event and natural gas will be in short supply, the shortage will be compensated by imported oil. An increase in consumption of imported oil of 2.5 million barrels a day would mean a decrease of 10 percent in the variable, and this was taken to be the impact. The aggravation caused by this event is assumed to begin immediately, but not reach its maximum for several years, after which relief is expected as the difficulties are partially resolved.

Event 123. Conservation Efforts Using Newly Developed Technologies (to Achieve Increases in Thermal Engine Efficiencies, Reductions in Heat Losses, the Productive Use of Waste Heat, Etc.) Reduce Petroleum Consumption by 20 Percent from Previously Expected Levels.

Estimates as high as savings of 30 percent of total energy reduction through the use of such conservation techniques have been made (for example, L. Schipper and Alan J. Lichtenberg, "Efficient Energy Use and Well Being: The Swedish Example," Science, Vol. 194 [December 3, 1976], p. 1012). A 20 percent reduction in consumption for petroleum will result in an increase in the variable of 20 percent. Since much of the technology for accomplishing these reductions is already developed, the main impediment to achieving

such conservation is primarily cost-effectiveness and, in the case of automobiles, continuing value for heavier cars and high horsepower engines. Vigorous pursuit of such conservation efforts, however, could produce results in a relatively few years.

Event 124. Increased Exploration and Drilling Activities Double the Rate of Discovery of Onshore and Offshore Petroleum Reserves.

This event relates the level of domestic production to general economic activity. The National Petroleum Council has estimated annual reserve additions and the consequent wellhead production of petroleum liquids under several different appropriate economic and political scenarios (National Petroleum Council, U.S. Energy Outlook: Oil and Gas Availability [Washington, D.C.: U.S. Government Printing Office, 1973]). The most optimistic of these scenarios shows an increase in the reserve additions of 100 percent over the most pessimistic scenario, which reflects a low finding rate and a current downward trend in the drilling rate. The result in wellhead production is an increase of 50 percent between these 2 scenarios. An increase of 50 percent in production would mean an increase in 50 percent of the variable, interpreting the event as indicating the increase in production from what it would have been otherwise. The years to maximum impact for this event are consistent with the time frame suggested by the National Petroleum Council.

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00540   -19DOMESTIC PETROLEUM AS A PERCENT OF CONSUMPTION - SCENARIO "A"
00550   -2  7777 4      11  3 10      8.000 10      8.000 1
00560    04    11    PP*     809000     *     055070
00570   104    11IUSE OF TELECOMMUNICATIONS REDUCES THE AMOUNT OF
00580   114    11ALL TRAVEL BE 20 PERCENT.
00590   -2  7777 4      23  2  4      5.000 15     10.000 1
00600    04    23    PP*     809000     *     102030
00610   104    23SYNTHETIC GAS FROM COAL IS COMMERCIALLY AVAILABLE.
00630   -2  7777 4      31  1  5      3.000  5      3.000 1
00640    04    31    PP*     809000     *     102540
00650   104    31THE NAVAL PETROLEUM RESERVES ARE OPENED TO
00660   114    31COMMERCIAL EXPLOITATION.
00670   -2  7777 4      33  1  5      7.000  5      7.000 1
00680    04    33    PP*     809000     *     012030
00690   104    33PRODUCTION REACHES 1/2 MILLION BARRELS A DAY
00700   114    33OF SHALE OIL.
00710   -2  7777 4      34  1  3     15.000 15     15.000 1
00720    04    34    PP*     809000     *     012025
00730   104    34THE ATLANTIC OUTER CONTINENTAL SHELF PRODUCES
00740   114    341 MILLION OF BARRELS OF OIL PER DAY.
00750   -2  7777 4      35  3  5     10.000  5     10.000 1
00760    04    35    PP*     809000     *     013540
00770   104    35SOLAR ENERGY, REFUSE BURNING, AND GEOTHERMAL POWER
00780   114    35CONSTITUTE 3-4 PERCENT OF THE TOTAL U.S.
00790   124    35ENERGY REQUIREMENTS ANNUALLY
00800   -2  7777 4      36  3  5      1.000  5      1.000 1
00810    04    36    PP*     809000     *     013540
00820   104    35U.S. WIND ENERGY PROGRAM PRODUCES THE
00830   114    36ENERGY EQUIVALENT OF 200,000 BARRELS OF OIL A
00840   124    36DAY
00850   -2  7777 4      40  1  4     10.000  5     10.000 1
00860    04    40    PP*     809000     *     011030
00870   104    40COAL AND NUCLEAR STATIONS CONTRIBUTE 75% OF
00880   114    40ELECTRICAL ENERGY.
00890   -2  7777 4      42  3  7      5.000 12      7.000 1
00900    04    42    PP*     809000     *     011015
00910   104    42NON-PETROLEUM SOURCES OF PRIMARY POWER FOR
00920   114    42GROUND TRANSPORTATION(STORAGE BATTERIES,
00930   124    42FUEL CELLS, ELECTRO-MAGNETIC PROPULSION AND
00940   134    42THE LIKE) ACCOUNT FOR ONE QUARTER OF THE
00950   144    42TRANSPORTATION ENERGY DEMAND.
00960   -2  7777 4      45  1  2      5.000  2      5.000 1
00970    04    45    PP*     809000     *     155065
00980   104    45A NATIONAL PROGRAM FOR RAW MATERIAL RESOURCE
00990   114    45RATIONING IS ESTABLISHED.
01000   -2  7777 4      47  3  5      3.000 10      5.000 1
01010    04    47    PP*     809000     *     011020
01020   104    47MORE THAN 10,000 MILES OF THE INTERSTATE HIGH-
01030   114    47WAY ARE ELECTRIFIED AND AUTOMATED TO ACCOMMODATE DUAL-
01040   124    47MODE AUTOMOBILES.
01100   -2  7777 4      49  0  1     12.000  3     25.000 1
01110    04    49    PP*     809000     *     809090
01120   104    49ALASKA OIL IS ADDED TO DOMESTIC PRODUCTION.
01130   -2  7777 4      53  1 10    -10.000 10    -10.000 1
01140    04    53    PP*     809000     *     101520
01150   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
01160   114    53TERM INVESTMENT NEEDS OF INDUSTRY.
01170   -2  7777 4      57  3  7      2.000 12      4.000 1
01180    04    57    PP*     809000     *     016075
01190   104    57$10 BILLION PER YEAR OF GOVERNMENT FUNDS ARE
01200   114    57DEVOTED TO URBAN TRANSIT SYSTEM DEVELOPMENT
01210   124    57(APPROXIMATELY $2 BILLION IN 1974).
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TIA Event-Impact Input

(See p. 2.4 for key to the data.)

```
01220   -2  7777 4      82  1  5     5.000  5     5.000 1
01230    04    82    PP*    809000     *     306070
01240   104    82A PROGRESSIVE TAX IS IMPOSED ON ALL ENERGY
01250   114    82USAGE WITH THE PROCEEDS FUNNELED INTO ENERGY
01260   124    82PRODUCTION AND CONSERVATION R&D PROGRAMS.
01270   -2  7777 4      83  1  3     2.000  3     2.000 1
01280    04    83    PP*    809000     *     014060
01290   104    83CAR-POOLING FOR TRAVEL TO WORK BECOMES MANDATORY.
01300   -2  7777 4      88  1 10   -10.000 10   -10.000 1
01310    04    88    PP*    809000     *     204050
01320   104    88A NUCLEAR MORATORIM IS CALLED IN NEW CONSTRUCTION
01330   114    88WITH A COMPLETE RE-EVALUATION OF NUCLEAR POWER
01340   124    88GENERATION.
01350   -2  7777 4      89  7 10     3.000 10     3.000 1
01360    04    99    PP*    809000     *     205070
01370   104    89FEDERAL FUNDS ARE WITHHELD IN ORDER TO STOP URBAN
01380   114    89EXPRESSWAY CONSTRUCTION.
01390   -2  7777 4     100  5  5   -10.000 10    -5.000 1
01400    04   100    PP*    809000     *     105050
01410   104   100COAL PRODUCTION FAILS TO REACH PROJECTED LEVELS
01420   114   100BECAUSE OF LABOR PROBLEMS, INADEQUATE TRANSPORTA-
01430   124   100TION, AND ENVIRONMENTAL CONSTRAINTS.
01460   -2  7777 4     123  2  5    20.000  5    20.000 1
01470    04   123    PP*    809000     *     015070
01480   104   123CONSERVATION EFFORTS USING NEWLY DEVELOPED
01485   114   123TECHNOLOGIES (TO ACHIEVE INCREASES IN THERMAL ENGINE
01490   124   123EFFICIENCIES, REDUCTIONS IN HEAT LOSSES, THE PRO-
01495   134   123DUCTIVE USE OF WASTE HEAT, ETC.) REDUCE PETROLEUM
01500   144   123CONSUMPTION BY 20 PERCENT.
01510   -2  7777 4     124  2  7    50.000  7    50.000 1
01520    04   124    PP*    809000     *     013040
01530   104   124INCREASED EXPLORATION AND DRILLING ACTIVITIES DOUBLES
01533   114   124THE RATE OF DISCOVERY OF ON-SHORE AND OFF-SHORE
01536   124   124PETROLEUM RESERVES.
01550   -2  7777 4     171  1  5   -10.000  5   -10.000 1
01560    04   171    PP*    809000     *     051520
01570   104   1710PEC DISOLVES.
```

TIA Event-Impact Input (Cont.)

(See p. 2.4 for key to the data.)

Capital Expenditures by Business for Air and Water Pollution Abatement

BASELINE

Historic data for the variable has been developed only since 1967, when environmental legislation began to put significant new demands on industry. The baseline fit to the historic data is good ($R^2 = 0.91$). The rapid growth in capital expenditures for pollution is expected to continue in the near term but to level off as air and water standards are met by industry. Nevertheless, without technological breakthroughs impacting on pollution abatement economics and with no evidence for any serious relaxation in environemntal constraints, the baseline projection will nearly triple by the end of the century.

```
FA1003
00010      1003   1967   1975   1976   2000   1976        7        0.000       20.000
00020  0.90672572                          -3330.08          51.22
00030  1967              2.00              1.52
00040  1968              1.60              2.25
00050  1969              2.40              2.96
00060  1970              3.60              3.65
00070  1971              4.50              4.32
00080  1972              5.90              4.97
00090  1973              6.20              5.60
00100  1974              5.90              6.22
00110  1975              5.20              6.82
00120  1976              0.00              7.40
00130  1977              0.00              7.97
00140  1978              0.00              8.53
00150  1979              0.00              9.07
00160  1980              0.00              9.59
00170  1981              0.00             10.11
00180  1982              0.00             10.61
00190  1983              0.00             11.10
00200  1984              0.00             11.58
00210  1985              0.00             12.04
00220  1986              0.00             12.50
00230  1987              0.00             12.94
00240  1988              0.00             13.38
00250  1989              0.00             13.80
00260  1990              0.00             14.22
00270  1991              0.00             14.63
00280  1992              0.00             15.02
00290  1993              0.00             15.41
00300  1994              0.00             15.79
00310  1995              0.00             16.17
00320  1996              0.00             16.53
00330  1997              0.00             16.89
00340  1998              0.00             17.24
00350  1999              0.00             17.58
00360  2000              0.00             17.92
```

Baseline (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 23. Synthetic Gas from Coal Is Commercially Available.

Although the combustion of gas is relatively clean, its production from coal implies air, water, and solid waste (mine spoil, ash, and sulfur) pollution. Further air pollution may be incurred if coal is shipped to a gasification site remote from the mine. Hence, it was estimated that an additional 3-5 percent penalty would have to be paid to control air and water pollution caused by gases vented during sulfur removal and burning of residual oils and tars and by cooling water facilities to recycle (in some processes, polluted) water.

Event 42. Non-Petroleum Sources of Primary Power for Ground Transportation (Storage Batteries, Fuel Cells, Electromagnetic Propulsion, and the Like) Account for One-Quarter of the Transportation Energy Demand.

A shift of this nature alleviates pollution of mobile sources at the expense of manufacturers and utilities. However, U.S. Commerce Department data indicate utilities spend twice as much for pollution abatement per unit of energy consumed. A shift of one-quarter of the transportation energy demand, recognizing economies of scale and efficiencies of electric propulsion, has been estimated to increase this variable by 3 percent and grow to 5 percent as more coal is used to satisfy demand for electricity.

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

Business expenditures for pollution abatement are positively correlated with new plant and equipment expenditures. As sources of capital become scarce, business will invest in ventures which do not require heavy expenditure in "non-productive" pollution equipment and may have to defer capital investment completely for lack of funds. On the other hand, pressures to meet environmental standards will continue. For these considerations the impact of this event on abatement expenditures is estimated at a -5 percent.

Event 56. One-Half of Consumer Durables Are Fabricated Using Recycled Materials.

U.S. Commerce Department data suggest that more than one-quarter of abatement expenditures comes from durable goods manufacturers, and more than 50 percent of that is attributable to the primary metals industries. Since the recycling industry will itself need pollution abatement, the apparent reduction in abatement expenditures will not be fully realized and is estimated at 2 percent, growing to 5 percent as the recycling industry becomes mature.

Event 77. Congress Enacts a New Tax on Goods and Services Proportional to Their Environmental Impact, Allocating These Funds for Environmental Improvements.

This attempt to convert external to internal cost will have an almost immediate effect on the funds available for abatement but will also suppress demand for environmentally damaging goods by raising their effective price to the consumer. The net effect has been estimated to be an increase of 5 percent in the amount spent by business for abatement.

Event 82. A Progressive Tax Is Imposed on All Energy Usage with the Proceeds Funneled into Energy Production and Conservation R&D Programs.

This effective price increase on energy and the conservation programs which the tax supports will suppress demand for energy and energy-intensive goods. The general decline in demand for goods and services will affect expenditures for new plant and equipment hence reducing pollution abatement expenditures, here estimated at 2 percent.

Event 155. Pollution Abatement Requirements Are Allowed to be Dependent on Industrial and Economic Growth.

Environmental factors may seriously constrain economic growth and cause overburdening stress to industry. Relaxation of environmental demands to allow for economic adjustment will have a large impact on pollution control expenditures, and a 25 percent decrease is estimated to be an appropriate response to such a policy.

```
00370   -19EXPENDITURES FOR POLLUTION ABATEMENT   -  SCENARIO "A"
00380   -2  7777 4      23  3  6      3.000 10      5.000 1
00390    04     23     PP*     809000     *     102030
00400   104     23SYNTHETIC GAS FROM COAL IS COMMERCIALLY AVAILABLE.
00420   -2  7777 4      29  4  7     -2.000 10     -4.000 1
00430    04     29     PP*     809000     *     015060
00440   104     29CAR LIFETIMES ARE EXTENDED TO DOUBLE 1975
00450   114     29EXPECTED VALUES.
00460   -2  7777 4      32  3  5      1.000 10      2.000 1
00470    04     32     PP*     809000     *     054050
00480   104     32DOMESTIC URANIUM SUPPLIES FALL 25 PERCENT
00490   114     32SHORT OF REQUIREMENTS.
00500   -2  7777 4      33  4  7      3.000 10      2.000 1
00510    04     33     PP*     809000     *     012030
00520   104     33PRODUCTION REACHES 1/2 MILLION BARRELS A
00530   114     33DAY OF SHALE OIL.
00540   -2  7777 4      35  5  8     -2.000 12     -4.000 1
00550    04     35     PP*     809000     *     013540
00560   104     35SOLAR ENERGY, REFUSE BURNING, AND GEOTHERMAL POWER
00570   114     35CONSTITUTE 3-4 PERCENT OF THE TOTAL U.S.
00580   124     35ENERGY REQUIREMENTS ANNUALLY.
00590   -2  7777 4      42  4  8      3.000 12      5.000 1
00600    04     42     PP*     809000     *     011015
00610   104     42NON-PETROLEUM SOURCES OF PRIMARY POWER FOR
00620   114     42GROUND TRANSPORTATION (STORAGE BATTERIES,
00630   124     42FUEL CELLS, ELECTRO-MAGNETIC PROPULSION AND
00640   134     42THE LIKE) ACCOUNT FOR ONE QUARTER OF THE
00650   144     42TRANSPORTATION ENERGY DEMAND.
00660   -2  7777 4      53  3  6     -5.000  6     -5.000 1
00670    04     53     PP*     809000     *     101520
00680   104     53CAPITAL RESOURCES ARE NOT ABLE TO MEET LONG-
00690   114     53TERM INVESTMENT NEEDS OF INDUSTRY.
00700   -2  7777 4      56  4  7     -2.000 15     -5.000 1
00710    04     56     PP*     809000     *     014060
00720   104     56ONE-HALF OF CONSUMER DURABLES ARE FABRICATED
00730   114     56USING RECYCLED MATERIALS.
00740   -2  7777 4      66  2  4      3.000 10      5.000 1
00750    04     66     PP*     809000     *     205060
00760   104     66FEDERAL LEGISLATION REQUIRES NATURAL GAS
00770   114     66ALLOCATION ON A NATIONAL BASIS.
00780   -2  7777 4      77  2  5      5.000  5      5.000 1
00790    04     77     PP*     809000     *     304060
00800   104     77CONGRESS ENACTS A NEW TAX ON GOODS AND
00810   114     77SERVICES PROPORTIONAL TO THEIR ENVIRONMENTAL
00820   124     77IMPACT, ALLOCATING THESE FUNDS FOR ENVIRON-
00830   134     77MENTAL IMPROVEMENTS.
00840   -2  7777 4      80  3  5    -15.000 10    -15.000 1
00850    04     80     PP*     809000     *     010101
00870   104     80AREAS HAVING AIR POLLUTION BELOW MAXIMUM LEGAL
00880   114     80LEVELS ARE ALLOWED TO INCREASE POLLUTION TO
00890   124     80THESE LEVELS.
00900   -2  7777 4      82  2  5     -2.000  6     -2.000 1
00910    04     82     PP*     809000     *     306070
00920   104     82A PROGRESSIVE TAX IS IMPOSED ON ALL ENERGY
00930   114     82USAGE WITH THE PROCEEDS FUNNELED INTO ENERGY
00940   124     82PRODUCTION AND CONSERVATION R&D PROGRAMS.
00960   -2  7777 4      88  3  7      1.000 12      2.000 1
00970    04     88     PP*     809000     *     204050
00980   104     88A NUCLEAR MORATORIUM IS CALLED IN NEW CONSTRUCTION
00990   114     88WITH A COMPLETE RE-EVALUATION OF NUCLEAR POWER
01000   124     88GENERATION.
01010   -2  7777 4     155  1 10    -25.000 10    -25.000 1
01020    04    155     PP*     809000     *     205070
01030   104    155POLLUTION ABATEMENT REQUIREMENTS ARE ALLOWED TO BE
01040   114    155DEPENDENT ON INDUSTRIAL AND ECONOMIC GROWTH.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

All Social Welfare Spending as a Percent of Gross National Product

BASELINE

As was the case for government spending, attempts to obtain separate baselines were unsuccessful. The very rapid growth in the 1960's and 1970's was almost exponential in nature and, when a regression or growth rate ratio approach was tried, the resulting estimates were too high. A single baseline, however, gives an excellent fit to the historic data ($R^2 = 0.96$) and shows that as the gross national product increases, the growth rate of the percentage of social welfare spending, while still positive, decreases as one might expect.

```
FA1089
00010      1089   1950   1975   1976   2000   1976       2       0.000     100.000
00020  0.95538434                              0.02              0.01
00030      1950            8.21              6.87
00040      1951            7.28              7.13
00050      1952            7.37              7.41
00060      1953            7.39              7.70
00070      1954            6.70              7.99
00080      1955            8.17              8.30
00090      1956            8.35              8.63
00100      1957            8.89              8.96
00110      1958           10.13              9.31
00120      1959           10.24              9.67
00130      1960           10.33             10.04
00140      1961           11.13             10.43
00150      1962           11.11             10.93
00160      1963           11.23             11.25
00170      1964           11.25             11.69
00180      1965           11.22             12.14
00190      1966           11.58             12.61
00200      1967           12.52             13.10
00210      1968           12.90             13.60
00220      1969           13.56             14.13
00230      1970           14.84             14.68
00240      1971           16.17             15.25
00250      1972           16.34             15.84
00260      1973           16.41             16.45
00270      1974           16.93             17.09
00280      1975           18.90             17.75
00290      1976            0.00             17.60
00300      1977            0.00             18.00
00310      1978            0.00             18.60
00320      1979            0.00             19.10
00330      1980            0.00             19.60
00340      1981            0.00             20.20
00350      1982            0.00             20.70
00360      1983            0.00             21.30
00370      1984            0.00             21.90
00380      1985            0.00             22.50
00390      1986            0.00             23.20
00400      1987            0.00             23.80
00410      1988            0.00             24.50
00420      1989            0.00             25.20
00430      1990            0.00             25.9
00440      1991            0.00             26.60
00450      1992            0.00             27.30
00460      1993            0.00             28.10
00470      1994            0.00             28.90
00480      1995            0.00             29.70
00490      1996            0.00             30.50
00500      1997            0.00             31.40
00510      1998            0.00             32.30
00520      1999            0.00             33.20
00530      2000            0.00             34.10
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 54. The DOD Budget Increases to at Least 50 Percent of the Federal Budget (About 27 Percent in 1975).

This event implies a re-ordering of priorities within the Federal budget. It is assumed that this event occurrence would reduce welfare expenditures 5 percent. If this had occurred while GNP remained stable in 1975, the welfare expenditures percent would fall by 5. This was the impact used in the TIA analysis.

Event 55. Wage, Price, Profit, and Interest Rate Controls Are Permanently Established.

Since the imposition of wage-price controls would be, in effect, a regressive tax upon the needy and indigent, it was assumed that the Federal Government would move to take ameliorative action. These steps would increase welfare spending by approximately $15 billion. The impact on the variable is 5 percent, using a 1975 base for calculations.

Event 75. A National Program of Socialized Medicine Is Established.

The implementation of socialized medicine was assumed to have a cost of $50 billion. This amount, however, was assumed to replace private payments for medical care of the same magnitude, thus leaving GNP unchanged. The increase in the welfare expenditure percent was approximately 18 on a basis of 1975 figures.

Event 78. Federal Funds for Community Development, to Revitalize Cities, Increase Three-Fold over the 1975 Level (Community Development Funds Totaled $3.2 Billion in 1975).

The level of spending implied by this event is $9.6 billion. Of this total, 80 was assumed to be new funding with the remaining 20 percent coming from budget shifts. The expenditure of this sum was assumed to cause an increase in GNP of 1.5 times the amount of the increased spending. The resultant increase in the welfare expenditures percent is approximately 3.

Event 84. Federal Government Assumes Full Responsibility for All Public Aid Payments.

It was assumed that this event would cause all social welfare payments to be brought up to minimum Federal levels. The cost of this action was assumed to be about $9 billion. Based on 1975 figures this would increase the welfare expenditure by some 3 percent.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

While the cost of this program was estimated at $15 billion ($7 billion for increases in Social Security and about $8 billion for education), it was

assumed that the net effect on expenditures on social welfare would be somewhat less. This would result from switching already budgeted funds to meet this specific need. The effect on the welfare expenditure was calculated at 5 percent, but was reduced to a 3 percent increase for use in the TIA analysis. It should be noted that this adjustment was somewhat arbitrary and was made in order to reduce what was considered to be a "high" calculated impact.

Event 111. Automated Individual Instruction Is Introduced at All Educational Levels.

The cost, in terms of governmental spending, of implementing such a program was assumed to be $10 billion. These funds, except for $1.5 billion obtained from budgetary switching, were assumed to be additional or new spending. Calculating on a 1975 base, the impact on the welfare expenditure is approximately 3 percent.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget Is Balanced on an Expenditure Basis.

This event implies a marked change in the degree of influence by government, specifically at the Federal level. Since the event is qualitative, no exact computations could be assumed. Instead, a 15 percent reduction in welfare spending was assumed and used in the TIA analysis. This would imply approximately a $40 billion cutback.

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00540   -19SOCIAL WELFARE AS A PERCENT OF GNP  -  SCENARIO "A"
00550   -2  7777 4      2  1  5     5.000 10     2.500 1
00560    04     2    PP*     809000     *     203040
00570   104     02SUBSIDIZED DAY-CARE CENTERS ARE MADE AVAILABLE TO
00575   114     02ALL MOTHERS IN THE LABOR FORCE.
00580   -2  7777 4      9  1  3     1.500  8     0.500 1
00590    04     9    PP*     809000     *     308090
00600   104     09GOVERNMENT SUBSIDIZES RELOCATION AND TRAINING OF
00610   114     09NEEDY RURAL WORKERS TO ENCOURAGE MIGRATION TO
00620   124     09URBAN CENTERS.
00640   -2  7777 4     54  1  1    -5.000  5    -1.000 1
00650    04    54    PP*     809000     *     050510
00660   104     54THE DOD BUDGET INCREASES TO AT LEAST 50% OF THE
00670   114     54FEDERAL BUDGET (ABOUT 27% IN 1975).
00680   -2  7777 4     55  1  5     5.000  8     3.000 1
00690    04    55    PP*     809000     *     308095
00700   104     55WAGE, PRICE, PROFIT AND INTEREST RATE CONTROLS
00710   114     55ARE PERMANENTLY ESTABLISHED.
00720   -2  7777 4     73  1  3     7.700  8     5.000 1
00730    04    73    PP*     809000     *     104050
00740   104     73LEGISLATION PROVIDING A GUARANTEED MINIMUM
00750   114     73ANNUAL INCOME FOR U.S. CITIZENS.
00760   -2  7777 4     75  1  5    18.000 15    15.000 1
00770    04    75    PP*     809000     *     012545
00780   104     75A NATIONAL PROGRAM OF SOCIALIZED MEDICINE IS
00790   114     75ESTABLISHED.
00800   -2  7777 4     78  1  3     3.000  5     0.500 1
00810    04    78    PP*     809000     *     205070
00820   104     78FEDERAL FUNDS FOR COMMUNITY DEVELOPMENT, TO
00830   114     78REVITALIZE CITIES, INCREASE THREEFOLD OVER THE
00840   124     781975 LEVEL.  (COMMUNITY DEVELOPMENT FUNDS
00850   134     78TOTALLED $3.2 BILLION IN 1975).
00860   -2  7777 4     84  1  3     3.000  5     1.000 1
00870    04    84    PP*     809000     *     306070
00880   104     84THE FEDERAL GOV'T ASSUMES FULL RESPONSIBILITY
00890   114     84FOR ALL PUBLIC PAYMENTS.
00910   -2  7777 4     93  1  6     3.000 15     2.000 1
00920    04    93    PP*     809000     *     105060
00930   104     93THE FEDERAL GOVERNMENT ATTEMPTS TO RESTRICT THE
00940   114     93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES TO
00950   124     93ENCOURAGE ARLY RETIREMENT OR HGIHER LEVELS
00960   134     93OF PUBLIC EDUCATION.
00970   -2  7777 4    105  1  5   -12.000 15   -10.000 1
00980    04   105    PP*     809000     *     010510
00990   104    105PRIVATE PENSION PLANS REPLACE THE SOCIAL SECURITY
01000   114    105SYSTEM IN A MAJORITY OF STATES.
01010   -2  7777 4    111  1  5     3.500 10     1.500 1
01020    04   111    PP*     809000     *     014050
01030   104    111AUTOMATED INDIVIDUAL INSTRUCTION IS INTODUCED AT ALL
01040   114    111EDUCATIONAL LEVELS.
01050   -2  7777 4    152  1  5   -15.000 10   -10.000 1
01060    04   152    PP*     809000     *     010101
01070   104    152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
01074   114    152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
01078   124    152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
01082   134    152MONETARY POLICY AS A DISCRETIONARY TOOL,
01086   144    152AND THE FEDERAL BUDGET IS BALANCED.
01090   -2  7777 4    183  1  3     4.500  5     1.500 1
01100    04   183    PP*     809000     *     606060
01110   104    183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%
01120   114    183AND REMAINS THERE FOR EIGHT CONSECUTIVE QUARTERS.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for k
to the data.)

Unemployment

In order to derive an average unemployment rate for each of the scenarios it was first necessary to define the level of unemployment which is to be considered full employment. There has been and continues to be a great deal of controversy in economic theory as to what level of unemployment constitutes full employment. Most economists do agree, however, that a 4 percent level of unemployment which was once the policy target is too low. In the late 1960's and 1970's the increased participation of women and teenagers has pushed the full employment target to at least 5 percent unemployment. This level was chosen to represent full employment in the five socioeconomic scenarios.

In any conceivable world there will always be a certain amount of frictional and seasonal unemployment as workers change jobs or are laid off due to weather conditions. Two other types of unemployment, structural and cyclical (or deficient demand), are of prime interest in each of the scenarios since these two basic types are amenable to change if the economic environment and the policy prescription are "correct."

Table 3 depicts a selected list of indicators and their role in each scenario which would have some impact on unemployment. Note that the list is selective and is intended to be suggestive of the tenor of each scenario. Using this information, an intuitive estimate of the unemployment rate was made for each scenario. A short narrative which explains the reasoning involved follows.

Table 3

	Limited Growth A	Expansive Growth B	Individual Affluence C	Hardship D	Resource Allocation R
GNP growth	low	high	high	low	moderate
population	low	high	low	high	moderate
government retraining	yes	no	no	yes	yes
population planning guidelines	yes	no	yes	no	yes
urban revitalization	yes	no	yes	no	yes
Federal attempts to restrict labor force	yes	no	no	yes	yes
decline in middle-class work attitude	yes	no	no	no	no
marriage rate declines	yes	yes	yes	no	yes
automation	no	moderate	yes	no	no
laissez-faire government stance	no	yes	no	no	no
strong government presence	yes	no	yes	yes	yes
formation of new cities	no	yes	yes	no	yes
capital shortage	no	no	no	yes	no
cartels	yes	no	no	yes	no
skill obsolescence /retraining	no	yes	yes	no	no

SCENARIO A

The unemployment rate assumed in this scenario is 7 percent. The basic reason for this rather high rate is the low rate of economic growth. Even though population growth is low, and although the Federal Government takes a number of steps to ameliorate the problem, there is a large base of unemployment. In the late 1970's and into the earlier part of the next decade there was a significant amount of what was termed cyclical unemployment. As time progressed, however, and Federal efforts were somewhat fruitless, this unemployment was reclassified as structural unemployment. With the shift to a low-growth posture many of the unemployed were workers whose skills were no longer needed in changing economy. As the century closed it was clear to local and Federal authorities that the core cause of the unemployment was an economy which simply could not provide enough jobs. The unemployment statistics were a stark reminder that the low-growth policy did have significant societal costs for a small portion of the population.

SCENARIO B

The unemployment rate assumed for this scenario is 6 percent. As the economy entered the early 1980's it was growing at rates that provided a large number of new jobs. With population growing rapidly these new jobs were quickly scooped up by the large number of teenagers and women who were entering the labor force. The labor market seemed to be functioning well and the Federal Government, along with state and local authorities, adopted a "hands-off" attitude in the labor market.

As the economy grew rapidly there was much retraining that was needed to provide the necessary skill-mix to support further growth. This retraining which was on-going from the mid-1980's to the end of the century did cause more frictional unemployment than had been the case in the past, but the goal of a better job made it worthwhile. The laissez-faire policies in regard to employment policy did leave the poorly educated, low-skilled minority workers to fend for themselves. The general attitude, however, was that in good time the market mechanism would solve that problem also. But as the century closed this hard-core group of unemployables was the basic reason why full employment had not yet been attained.

SCENARIO C

The unemployment rate assumed for this scenario is 5 percent (the full employment level). The rapid economic growth coupled with low population growth and a very active governmental role are the principal reasons for the successful attainment of this low unemployment rate.

The Federal Government, by suggesting a framework for population distribution and by revitalizing cities, made a successful attack on the pockets of structural unemployment which frustrated past attempts to reach reach full employment. In fact, at both the macro and micro level, Federal policies, along with the rapid growth, supported a smoothly working,

efficient labor market. The 5 percent unemployed was composed mainly of the frictionally unemployed and those who worked in seasonal employment. There was of course a residue of hard-core unemployment, but the successful approach in dealing with the labor market achieved virtually full employment.

SCENARIO D

The unemployment rate assumed for this scenario is 9 percent. The basic forces behind this high rate are low GNP growth, high population growth, and the generally chaotic conditions which pervade the entire economy.

The Federal Government attempted a number of policy options, but none were successful in reducing the unemployment rate. When the relocation and subsidization of rural workers was undertaken most of the workers involved could not find continuous employment in their new locales. One basic cause of the low GNP growth was a capital shortage, and this had a severe impact on the labor market since without needed capital spending there were few new jobs created. In addition, cartels formed by Third World countries caused serious supply disruptions in key materials which in turn led to increased unemployment.

It seemed as if every potentially positive step governmental authorities undertook to reduce unemployment failed for one reason or another. At the same time the increase in expenditures on these fruitless programs increased the Federal deficit and thus put a limit on the extent of new ameliorative measures. Local authorities were seemingly as powerless as Federal policy-makers, and the rather poor fiscal conditions of states and municipalities prevented the adoption of locally tailored measures to reduce the amount of joblessness.

The continued high unemployment rate was one of the best indicators of the chaotic economic conditions which plagued the nation as the twenty-first century began.

SCENARIO R

The unemployment rate assumed for this scenario is 6.5 percent. This rate is somewhat higher than the full employment level of unemployment, and it is a result of moderate GNP growth and a comprehensive planning effort coordinated at all government levels.

The policy framework of the Federal Government contained several specific measures aimed at reducing the level of structural employment. Among these measures were government-subsidized retraining and relocation of rural workers, population distribution planning guidelines, revitalization of urban areas, and attempts to restrict labor force growth through extended education and early retirement. While each of these policies achieved some degree of success, there remained a portion of the unemployed that was seemingly untouched by these efforts. Government, wary of causing a rise in inflation,

seemed to be satisfied with the moderate success in reducing unemployment. The bulk of the labor force was content with its economic lot, and for the remaining unemployed, there were programs which lessened the economic consequences of joblessness. In all, government and the populace seemed satisfied with the level of growth and the accompanying level of unemployment.

Average Weekly Hours of Production Workers on Private Non-Agricultural Payrolls

Projected values for the average weekly hours[5] were computed from an identity equation relating gross national product (GNP), the output per man-hour of all persons in the private business sector expressed as an index of productivity (IP), the size of the civilian labor force (CL), and the unemployment rate (U) to average weekly hours (AVW). The identity relationship expresses GNP as a function of total hours worked, and the productivity and is shown in the following equation:

$$GNP = (K)(CL)(1 - U)(AVW)(IP)$$

The product $(CL)(1 - U)(AVW)$ equals total hours worked, in which CL is given in millions of people, and U is expressed as a fraction. GNP is expressed in constant dollars, and the index IP is based on the same reference year as GNP. K is a constant of proportionality.

Projected values for AVW were computed by solving for AVW and substituting into the equation projected values for each of the other variables. The equation for AVW is

$$AVW = \frac{GNP}{(K)(CL)(1 - U)(IP)}$$

Projected values for gross national product (GNP), the civilian labor force (CL), and the index of productivity (IP) were taken from the projections made for these variables computed for this study. Values for the unemployment rate (U) were taken as the unemployment rates were defined for each scenario.

Values for K have exhibited a slow change over time. Historical values for K were obtained by solving the identity equation for K and substituting into historic values for each of the other variables. The time series for K was then projected by a linear regression fit to the historic values. The results may be seen in the accompanying plot of K as a function of time (Table 4 and Figure 3). In computing AVW, the projected values of K were used.

---

[5] The definition includes the total private sector: mining and manufacturing; contract construction; transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and the service trades.

Table 4

PROPORTIONALITY CONSTANT, K
(Based on Constant 1975 Dollar Values of GNP)

Historic Data		Projected Data	
1950	4.37	1976	4.34
1952	5.01	1977	4.30
1954	4.95	1978	4.28
1956	4.82	1979	4.26
1958	4.79	1980	4.24
1960	4.68	1981	4.21
1962	4.64	1982	4.19
1964	4.52	1983	4.16
1966	4.55	1984	4.14
1968	4.54	1985	4.12
1970	4.50	1986	4.09
1972	4.45	1987	4.07
1974	4.08	1988	4.04
		1989	4.01
		1990	4.00
		1991	3.97
		1992	3.94
		1993	3.92
		1994	3.90
		1995	3.88
		1996	3.85
		1997	3.83
		1998	3.81
		1999	3.78
		2000	3.77

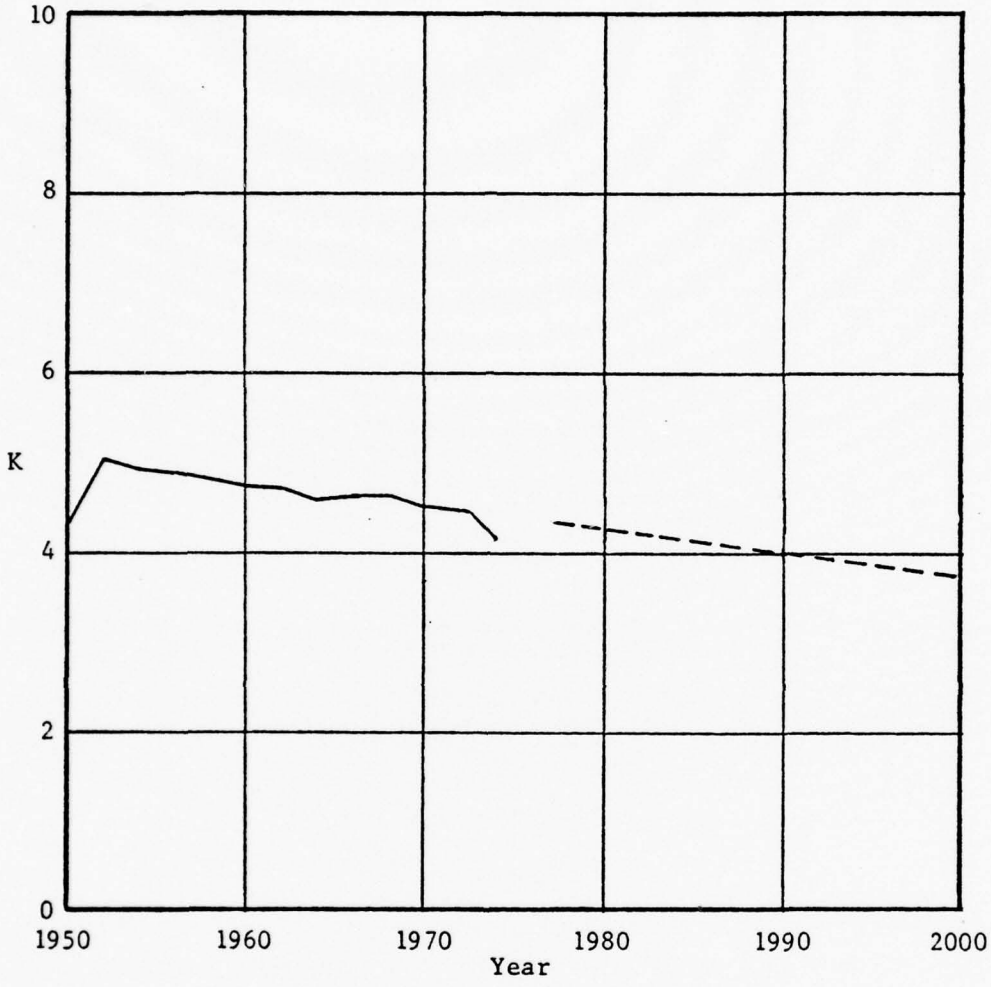

Figure 3. Proportionality constant, K (based on constant 1975 dollar values of GNP)

Labor Force Participation Rate

BASELINE

The historic data exhibit cyclical behavior, though the general trend reveals a slow increase in the participation rate. A monotonically increasing function was felt to adequately characterize the long-range behavior of the variable. Labor force participation has been increasing primarily because of the entry of women into the labor force, and this trend is projected to continue. Though the baseline does not follow the historic cyclical variations, absolute differences between fitted values and baseline values are small.

```
..TYPE FA7217
00010      7117   1950   1975   1976   2000   1976      14       0.000
◆◆100.000
00020     0.42879775                              0.00          0.12
00030     1950          59.90          59.78
00040     1951          60.40          59.84
00050     1952          60.40          59.90
00060     1953          60.20          59.96
00070     1954          60.00          60.02
00080     1955          60.40          60.08
00090     1956          61.00          60.13
00100     1957          60.60          60.19
00110     1958          60.40          60.25
00120     1959          60.20          60.31
00130     1960          60.20          60.37
00140     1961          60.20          60.43
00150     1962          59.70          60.48
00160     1963          59.60          60.54
00170     1964          59.60          60.60
00180     1965          59.70          60.66
00190     1966          60.10          60.72
00200     1967          60.60          60.77
00210     1968          60.70          60.83
00220     1969          61.10          60.89
00230     1970          61.30          60.95
00240     1971          61.00          61.01
00250     1972          61.00          61.06
00260     1973          61.40          61.12
00270     1974          61.80          61.18
00280     1975          61.80          61.24
00290     1976           0.00          61.30
00300     1977           0.00          61.35
00310     1978           0.00          61.41
00320     1979           0.00          61.47
00330     1980           0.00          61.53
00340     1981           0.00          61.58
00350     1982           0.00          61.64
00360     1983           0.00          61.70
00370     1984           0.00          61.76
00380     1985           0.00          61.81
00390     1986           0.00          61.87
00400     1987           0.00          61.93
00410     1988           0.00          61.99
00420     1989           0.00          62.04
00430     1990           0.00          62.10
00440     1991           0.00          62.16
00450     1992           0.00          62.22
00460     1993           0.00          62.27
00470     1994           0.00          62.33
00480     1995           0.00          62.39
00490     1996           0.00          62.44
00500     1997           0.00          62.50
00510     1998           0.00          62.56
00520     1999           0.00          62.62
00530     2000           0.00          62.67
```

Baseline (percent)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 53. Capital Resources Are Not Able to Meet Long-Term Investment Needs of Industry.

The most important influence on labor force participation rate over the long term is the availability of jobs, since persons who cannot find employment over a period of several years are likely to withdraw from the labor force and, in addition, prospective new entrants such as teenagers and women are likely to defer their entry. Jobs in industry are primarily created through capital investment to upgrade or expand facilities, and a large proportion of service jobs are directly or indirectly generated from a base of industrial jobs. Therefore, lack of capital resources for industry would be the most significant blow to labor participation which could occur, and a downward impact of 10 percent or 6 percentage points is estimated, reaching its maximum in 3 years. It is believed that at present about 2 percent of the labor force is discouraged workers, and we assume that approximately this same percentage would additionally become discouraged for 3 years for a total of 6 percent. This would be the maximum, for it would be inconceivable that the government would not take steps to provide remedial actions in such a contingency.

Event 54. The DOD Budget Increases to at Least 50 Percent of the Federal Budget (About 27 Percent in 1975).

Such a massive increase in defense expenditures would bring a sharp spurt in the labor force within two years of its institution. Not only direct jobs in defense industries would be affected, but also suppliers to these industries and services catering to the additional workers. In 1974, payrolls directly attributable to defense contracts totaled 24.9 billion. Dividing by an assumed $10,000 per worker ($1500 higher than the average manufacturing wage) an approximation of 2.5 million workers on direct defense contracts is obtained. Applying a multiplier effect for subcontracts and for supporting and indirect services, we arrive at an increase of 7 percent, or 4 percentage points, in labor force participation rate, equivalent to adding 3.5 million workers a year for 2 years. It is assumed that all of these workers represent net additions to the labor force.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

In 1985 there will be about 36 million people between 18 and 21 years of age and between 55 and 64 years of age. If the government provided incentives for 20 percent of these 2 groups to withdraw from or not to enter the labor force, a downward impact of 7 percent in the labor force participation rate would result. The effects would be felt within a year of the time the incentives were offered.

Event 94. Twenty-Five Percent of the Work Force Does Not Work the Standard Five-Day, Forty-Hour Work.

It is assumed that both the flexible and reduced work schedules will bring more people into the labor force. About 16 percent of the employed now voluntarily work part-time, but 29 percent of the unemployed want part-time work. Numerically, 1.1 million persons are looking for part-time jobs. If schedules were made more flexible, we assume that this number, plus an estimated 2 million now out of the labor force because of the non-availability of the hours they want, would obtain jobs or enter the labor force. These two groups would total about 3 million, or a 3 percent upward impact on the labor force participation rate. It would take two years to maximum impact as people out of the labor force gradually became aware of the new opportunities.

Event 96. Fifty Percent of Assembly Line Production Is Controlled by Computers.

It is difficult to estimate the net impact of this event because assembly line losses would be partially offset by computer operational personnel and gains in the computer manufacturing industry. On balance, we estimate about a 1.5 percent drop in labor force participation rate as unskilled persons formerly on the assembly line are unable to find work and drop out of the labor force. This would be a gradual process, taking five years to maximum impact.

Event 97. Middle-Class Attitudes Toward Work Are Challenged by the Rise of Strong Avocational Interests, Resulting in Decreased Demands for Career Advancement Opportunities.

It is assumed this event will affect dual-income families. Either one partner will withdraw from the labor force entirely or they may take turns going back in to support the family. The event implies that, generally, all people will work less. It could also heavily influence early retirements. The estimate is that at most (five years after it makes a strong appearance), this event could reduce the labor force participation rate by 1.5 percent.

```
05400   -19PARTICIPATION RATE SCENERIO A
05500   -2  7777 4       2  0  2      3.000  2      3.000 1
05600    04     2    PP♦     809000     ♦     203040
05700   104     2SUBSIDIZED DAY-CARE CENTERS ARE MADE AVAILABLE
05800   114     2TO ALL MOTHERS IN THE LABOR FORCE.
05900   -2  7777 4      53  0  3    -10.000  3    -10.000 1
06000    04    53    PP♦     809000     ♦     101520
06100   104    53CAPITAL RESOURCES ARE NOT ABLE TO MEET
06200   114    53LONG TERM INVESTMENT NEEDS OF INDUSTRY.
06300   -2  7777 4      54  0  2      7.000  2      7.000 1
06400    04    54    PP♦     809000     ♦     050510
06500   104    54THE DOD BUDGET INCREASES TO AT LEAST 50% OF THE
06600   114    54FEDERAL BUDGET (ABOUT 27% IN 1975).
06700   -2  7777 4      81  1  3      3.000  3      3.000 1
06800    04    81    PP♦     809000     ♦     102030
06900   104   ...81LEGISLATION IS ENACTED GUARANTEEING FULL EMPLOYEMENT.
07000   -2  7777 4      93  0  1     -7.000  1     -7.000 1
07100    04    93    PP♦     809000     ♦     105060
07200   104    93THE FEDERAL GOV'T WILL ATEMPT TO RESTRICT THE
07300   114    93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES
07400   124    93TO ENCOURAGE EARLY RETIREMENT, MORE EDUCATION.
07500   -2  7777 4      94  1  2      3.000  2      3.000 1
07600    04    94    PP♦     809000     ♦     206080
07700   104    94TWENTY-FIVE PER-CENT OF THE WORK FORCE DOES NOT WORK
07800   114    94THE STANDARD FIVE-DAY, FORTY HOUR WEEK.
07900   -2  7777 4      96  1  5     -1.500  5     -1.500 1
08000    04    96    PP♦     809000     ♦     011520
08100   104    96FIFTY PER-CENT OF ASSEMBLY LINE PRODUCTION IS
08200   114    96CONTROLLED BY COMPUTERS.
08300   -2  7777 4      97  1  5     -1.500  5     -1.500 1
08400    04    97    PP♦     809000     ♦     106080
08500   104    97MIDDLE CLASS ATTITUDES ABOUT WORK ARE
08600   114    97CHALLENGED BY THE RISE OF STRONG AVOCATIONAL
08700   124    97INTERESTS.
08800   -2  7777 4      98  1  3      2.000  3      2.000 1
08900    04    98    PP♦     809000     ♦     011020
09000   104    98NEARLY ALL WORKERS UNDERGO JOB RETRAINING BECAUSE
09100   114    98OF TECHNOLOGICAL OBSOLESCENECE OR CAREER CHANGE
09200   -2  7777 4     183  1  3     -7.00   3     -7.000 1
09300    04   183    PP♦     809000     ♦     606060
09400   104   183CAPACITY UTILIZATION IN MANUFACTURING FALLS TO 70%.
09500   -2  7777 4     186  1  5      7.000  5      7.000 1
09600    04   186    PP♦     809000     ♦     011520
09700   104   186THE STOCK OF CAPITAL PER WORKER AVERAGES 2.5% GROWTH
```

TIA Event-Impact Input

(See p. 2.4 for key to the data.)

Civilian Labor Force

Projected values for the size of the civilian labor force (CL) were computed from projections of the population over the age of 16 (Pop. 16+) and projections of the labor force participation rate (LPR) from the following equation:

$$CL = (Pop.\ 16+)(LPR)$$

Projected values for the population over the age of 16 were taken from the Census Bureau projections.[6] Series I, with the fertility rate of 2.7 births per woman, was used in the calculations for Scenarios B and D; Series II, with the fertility rate of 2.1 births per woman, was used in the calculations for Scenario R; and Series III, with the fertility rate of 2.1 births per woman, was used in the calculations for Scenarios A and C.

The projected values for the labor force participation rate were taken from the TIA projections for this variable computed for this study.

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[6] U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Series P-25, No. 601, Tables 7-9 (Washington, D.C.: U.S. Government Printing Office, October 1975), pp. 41-118.

Median Number of Years of School Completed by the Civilian Non-Institutional Population 25 Years and Over

BASELINE

Prior to 1964, the Bureau of the Census did not report educational attainment annually, and figures were available only for the years shown. The baseline fit to the historic data is good ($R^2 = 0.87$). The historic growth rate of the variable has been declining since the large post-World War II gains. The baseline's growth rate is approximately equal to the growth rate experienced since the early 1960's.

```
$A1013
00010      1013   1952   1975   1976   2000   1976      14       0.000      20.000
00020     0.87365541                              0.01          -0.31
00030     1952           10.10          10.61
00040     1957           10.60          11.02
00050     1959           11.00          11.18
00060     1962           11.40          11.42
00070     1964           11.70          11.58
00080     1965           11.80          11.66
00090     1966           12.00          11.74
00100     1967           12.00          11.81
00110     1968           12.10          11.89
00120     1969           12.10          11.97
00130     1970           12.20          12.05
00140     1971           12.20          12.13
00150     1972           12.20          12.21
00160     1973           12.30          12.28
00170     1974           12.30          12.36
00180     1975           12.30          12.44
00190     1976            0.00          12.51
00200     1977            0.00          12.59
00210     1978            0.00          12.66
00220     1979            0.00          12.74
00230     1980            0.00          12.82
00240     1981            0.00          12.89
00250     1982            0.00          12.96
00260     1983            0.00          13.04
00270     1984            0.00          13.11
00280     1985            0.00          13.19
00290     1986            0.00          13.26
00300     1987            0.00          13.33
00310     1988            0.00          13.40
00320     1989            0.00          13.48
00330     1990            0.00          13.55
00340     1991            0.00          13.62
00350     1992            0.00          13.69
00360     1993            0.00          13.76
00370     1994            0.00          13.83
00380     1995            0.00          13.90
00390     1996            0.00          13.97
00400     1997            0.00          14.03
00410     1998            0.00          14.10
00420     1999            0.00          14.17
00430     2000            0.00          14.24
```

Baseline (number of years)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 54. The DOD Budget Increases to at Least 50 Percent of the Federal Budget (About 27 Percent in 1975).

Such a large change in Federal spending for defense will take away from Federal funding for a wide variety of social services. The event is seen as reducing the Federal funding for higher education, and a nominal decrease of 1 percent is judged to be the maximum impact.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

A primary result of the implementation of this event will be to delay graduation of non-college-oriented students by offering courses which will make them more attractive candidates in the job market. A 2 percent increase in the variable is judged to mean a successful application of such a program. The maximum impact of this event will be realized over a very long period of time, during which much of the population will have had a chance to have been exposed to the new educational opportunities.

Event 97. Middle-Class Attitudes Toward Work Are Challenged by the Rise of Strong Avocational Interests, Resulting in Decreased Demands for Career Advancement Opportunities.

The thrust of this event is to lessen some of the demand for formal education. While avocational interests may require education, such offerings may not be part of the formal curriculum. The event will lead to informal schooling centered about new cultural directions such as has been seen in the last decade. It will also direct some energy away from work-oriented education into general cultural pursuits. The event is judged to have a negative impact on both the movement toward college from high school and also upon achieved levels of higher education, and a -5 percent impact is assigned. It is assumed that this maximum impact is realized only after one generation has passed through the public educational system.

```
00440   -19MEDIAN EDUCATION SCENERIO B
00500   -2  7777 4      9  3  5     1.000  5     1.000 1
00510    04     9    PP*     809000     *     153040
00520   104     9GOVERNMENT SUBSIDIZES RELOCATION AND TRAINING
00530   114     9OF NEEDY, RURAL WORKERS TO ENCOURAGE MIGRATION
00545   124     9TO URBAN CENTERS.
00560   -2  7777 4     54  2  7    -1.000  7    -1.000 1
00570    04    54    PP*     809000     *     102540
00580   104    54THE DOD BUDGET INCREASES TO AT LEAST 50% OF THE
00590   114    54FEDERAL BUDGET (ABOUT 27% IN 1975).
00600   -2  7777 4     93  4 20     2.000 20     2.000 1
00610    04    93    PP*     809000     *     010105
00620   104    93THE FEDERAL GOV'T WILL ATTEMPT TO RESTRICT THE
00630   114    93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES TO
00640   124    93ENCOURAGE EARLY RETIREMENT, HIGHER LEVELS OF
00650   134    93PUBLIC EDUCATION.
00660   -2  7777 4     97  4 12    -5.000 12    -5.000 1
00670    04    97    PP*     809000     *     051020
00680   104    97MIDDLE CLASS ATTITUDES TOWARD WORK
00690   114    97ARE CHALLENGED BY THE RISE OF STRONG
00700   124    97AVOCATIONAL INTERESTS.
00710   -2  7777 4     98  2  5     1.000  5     1.000 1
00720    04    98    PP*     809000     *     014060
00730   104    98NEARLY ALL WORKERS UNDERGO JOB RETRAINING BECAUSE OF
00740   114    98TECHNOLOGICAL OBSOLESCENCE OR VOLUNTARY CAREER CHANGE.
00750   -2  7777 4    115  4  8     1.000  8     1.000 1
00800    04   115    PP*     809000     *     104050
00810   104   115SIMULATORS ARE DEVELOPED TO PROVIDE TECHNICAL
00820   114   115TRAINING TO MENTALLY AND PHYSICALLY HANDICAPPED
00830   124   115PEOPLE TO PREPARE THEM TO RETURN TO SOCIETY.
00840   -2  7777 4    116  2  6     2.000  6     2.000 1
00850    04   116    PP*     809000     *     012040
00860   104   116FOUR YEAR OLD CHILDREN BEGIN ELEMENTARY
00865   114   116SCHOOL (FIRST GRADE).
00870   -2  7777 4    117  4  8     1.000  8     1.000 1
00880    04   117    PP*     809000     *     015065
00890   104   117PROGRAMS ARE IMPLEMENTED WHICH GREATLY INCREASE
00900   114   117THE LEVEL OF MULTILINGUAL PUBLIC EDUCATION
00910   124   117AT THE PRIMARY AND SECONDARY LEVELS.
00920   -2  7777 4    118  3  6     1.000  8     1.000 1
00930    04   118    PP*     809000     *     404550
00940   104   118MOST EMPLOYERS PROVIDE SCHOLARSHIPS AS A PART OF
00950   114   118THE EMPLOYEE BENEFIT PACKAGE.
00960   -2  7777 4    119  2  6    -1.000  6    -1.000 1
00970    04   119    PP*     809000     *     013090
00980   104   119BACHELORS DEGREE IS COMPRESSED FROM FOUR TO THREE
00990   114   119YEARS BY MAJORITY OF COLLEGES AND UNIVERSITIES.
01000   -2  7777 4    120  4  8     1.000  8     1.000 1
01010    04   120    PP*     809000     *     307550
01020   104   120SPEED READING TECHNIQUES ARE MADE PART OF THE
01030   114   120GENERAL EDUCATION CURRICULUM.
01040   -2  7777 4    121  2 10    -3.000 10    -3.000 1
01050    04   121    PP*     809000     *     011515
01060   104   121ONE OUT OF EVERY TEN COLLEGES AND UNIVERSITIES
01070   114   121IN THE U.S. IS FORCED TO MERGE OR CLOSE DOWN
01080   124   121DUE TO FINANCIAL PRESSURES.
```

TIA Event-Impact Input (Scenario B)

(See p. 2.4 for key to the data.)

Personal Consumption Expenditures for Transportation (Goods and Services)

BASELINE

In order to assure consistency with total personal consumption expenditures, the baselines for the PCE for transportation were derived by regressing the variable against total PCE.

The regression equation was

PCE for transportation = -7.87 + 0.0142(total PCE)

Scenario-dependent projections of the total PCE were derived from the regression of total PCE against gross national product (see discussion of total PCE, p. 4.29), and five baselines for the PCE for transportation were projected. In this way the baseline behavior of the transportation component of the total PCE was made consistent with the fundamental economic movement of each scenario. Perturbations about these separate baselines were then made by the TIA analysis for each scenario.

Regression Equation

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y) — FPCET = PCE FOR TRANSPORTATION
INDEPENDENT VARIABLE (X) — FFPCE = PCE (1975 DOLLARS, 1950-1974)

NUMBER OF OBSERVATIONS 25
DETERMINAT OF THE INVERSE MATRIX 1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.9899	.14232E-01	.42495E-03	33.490

REGRESSION INTERCEPT	-7.8702
MULTIPLE CORRELATION	.98990
STD. ERROR OF ESTIMATE	3.6524
COEFF OF DETERMINATION	.97991

```
FA1007
02570      1007   1950    1975    1976    2000    1976        9       0.000     300.000
02580     0.95060122                          0.52          -0.65
02590     1950            57.40           51.55
02600     1951            54.90           53.79
02610     1952            59.20           56.01
02620     1953            59.20           58.29
02630     1954            59.20           60.64
02640     1955            68.60           63.07
02650     1956            65.80           65.57
02660     1957            67.20           68.15
02670     1958            63.40           70.81
02680     1959            69.90           73.54
02690     1960            72.50           76.36
02700     1961            69.60           79.26
02710     1962            75.80           82.25
02720     1963            80.90           85.33
02730     1964            84.70           88.50
02740     1965            92.40           91.76
02750     1966            95.60           95.11
02760     1967            96.50           98.56
02770     1968           106.30          102.11
02780     1969           110.20          105.77
02790     1970           107.00          109.52
02800     1971           118.20          113.39
02810     1972           130.20          117.36
02820     1973           138.10          121.44
02830     1974           125.30          125.64
02840     1975           126.00          129.95
02850     1976             0.00          129.97
02860     1977             0.00          135.79
02870     1978             0.00          140.38
02880     1979             0.00          144.71
02890     1980             0.00          149.61
02900     1981             0.00          152.08
02910     1982             0.00          155.47
02920     1983             0.00          158.67
02930     1984             0.00          161.72
02940     1985             0.00          164.13
02950     1986             0.00          166.40
02960     1987             0.00          168.31
02970     1988             0.00          170.03
02980     1989             0.00          171.85
02990     1990             0.00          173.59
03000     1991             0.00          175.41
03010     1992             0.00          177.32
03020     1993             0.00          179.14
03030     1994             0.00          181.05
03040     1995             0.00          182.53
03050     1996             0.00          184.09
03060     1997             0.00          185.56
03070     1998             0.00          187.12
03080     1999             0.00          188.69
03090     2000             0.00          190.24
```

Baseline Scenario A (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA2007
02570      1007   1950   1975   1976   2000   1976        9       0.000     300.
02580  0.95060122                              0.52        -0.65
02590  1950            57.40          51.65
02600  1951            54.90          53.79
02610  1952            59.20          56.01
02620  1953            59.20          58.29
02630  1954            59.20          60.54
02640  1955            68.60          63.07
02650  1956            65.80          65.57
02660  1957            67.20          68.15
02670  1958            63.40          70.81
02680  1959            69.90          73.54
02690  1960            72.50          76.36
02700  1961            69.60          79.26
02710  1962            75.80          82.25
02720  1963            80.90          85.33
02730  1964            84.70          88.50
02740  1965            92.40          91.76
02750  1966            95.60          95.11
02760  1967            96.50          98.56
02770  1968           106.30         102.11
02780  1969           110.20         105.77
02790  1970           107.00         109.52
02800  1971           118.20         113.39
02810  1972           130.20         117.36
02820  1973           138.10         121.44
02830  1974           125.30         125.64
02840  1975           126.00         129.95
02850  1976             0.00         129.97
02860  1977             0.00         138.56
02870  1978             0.00         145.58
02880  1979             0.00         152.76
02890  1980             0.00         160.24
02900  1981             0.00         167.61
02910  1982             0.00         175.32
02920  1983             0.00         183.39
02930  1984             0.00         191.80
02940  1985             0.00         200.64
02950  1986             0.00         210.62
02960  1987             0.00         221.11
02970  1988             0.00         232.12
02980  1989             0.00         244.18
02990  1990             0.00         256.76
03000  1991             0.00         270.02
03010  1992             0.00         284.51
03020  1993             0.00         299.68
03030  1994             0.00         315.72
03040  1995             0.00         332.55
03050  1996             0.00         350.24
03060  1997             0.00         369.88
03070  1998             0.00         388.99
03080  1999             0.00         409.11
03090  2000             0.00         430.80
```

Baseline Scenario B (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA3007
02570      1007   1950   1975   1976   2000   1976        9       0.000     300.000
02580  0.95060122                              0.52        -0.65
02590      1950          57.40          51.65
02600      1951          54.90          53.79
02610      1952          59.20          56.01
02620      1953          59.20          58.29
02630      1954          59.20          60.64
02640      1955          68.60          63.07
02650      1956          65.80          65.57
02660      1957          67.20          68.15
02670      1958          63.40          70.81
02680      1959          69.90          73.54
02690      1960          72.50          76.36
02700      1961          69.60          79.26
02710      1962          75.80          82.25
02720      1963          80.90          85.33
02730      1964          84.70          88.50
02740      1965          92.40          91.76
02750      1966          95.60          95.11
02760      1967          96.50          98.56
02770      1968         106.30         102.11
02780      1969         110.20         105.77
02790      1970         107.00         109.52
02800      1971         118.20         113.39
02810      1972         130.20         117.36
02820      1973         138.10         121.44
02830      1974         125.30         125.64
02840      1975         126.00         129.95
02850      1976           0.00         129.97
02860      1977           0.00         138.55
02870      1978           0.00         145.58
02880      1979           0.00         152.78
02890      1980           0.00         160.24
02900      1981           0.00         167.44
02910      1982           0.00         174.98
02920      1983           0.00         182.78
02930      1984           0.00         191.11
02940      1985           0.00         199.60
02950      1986           0.00         209.15
02960      1987           0.00         219.20
02970      1988           0.00         229.62
02980      1989           0.00         241.06
02990      1990           0.00         253.03
03000      1991           0.00         265.51
03010      1992           0.00         279.22
03020      1993           0.00         293.61
03030      1994           0.00         308.61
03040      1995           0.00         324.48
03050      1996           0.00         341.13
03060      1997           0.00         358.56
03070      1998           0.00         376.95
03080      1999           0.00         396.20
03090      2000           0.00         416.40
```

Baseline Scenario C (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA4007
02570      1007   1950    1975    1976    2000    1976        9       0.000      300.000
02580  0.95060122                                  0.52        -0.65
02590      1950          57.40           51.65
02600      1951          54.90           53.79
02610      1952          59.20           56.01
02620      1953          59.20           58.29
02630      1954          59.20           60.64
02640      1955          58.60           63.07
02650      1956          65.80           65.57
02660      1957          67.20           68.15
02670      1958          63.40           70.91
02680      1959          69.90           73.54
02690      1960          72.50           76.36
02700      1961          69.60           79.26
02710      1962          75.80           82.25
02720      1963          80.90           85.33
02730      1964          84.70           88.50
02740      1965          92.40           91.76
02750      1966          95.60           95.11
02760      1967          96.50           98.56
02770      1968         106.30          102.11
02780      1969         110.20          105.77
02790      1970         107.00          109.52
02800      1971         118.20          113.39
02810      1972         130.20          117.36
02820      1973         138.10          121.44
02830      1974         125.30          125.64
02840      1975         126.00          129.95
02850      1976           0.00          129.97
02860      1977           0.00          135.79
02870      1978           0.00          140.38
02880      1979           0.00          144.20
02890      1980           0.00          148.18
02900      1981           0.00          152.25
02910      1982           0.00          156.25
02920      1983           0.00          160.15
02930      1984           0.00          163.88
02940      1985           0.00          167.00
02950      1986           0.00          169.77
02960      1987           0.00          172.46
02970      1988           0.00          175.24
02980      1989           0.00          177.93
02990      1990           0.00          180.70
03000      1991           0.00          183.56
03010      1992           0.00          186.43
03020      1993           0.00          189.37
03030      1994           0.00          192.14
03040      1995           0.00          194.75
03050      1996           0.00          197.36
03060      1997           0.00          200.05
03070      1998           0.00          202.55
03080      1999           0.00          205.07
03090      2000           0.00          207.59
```

Baseline Scenario D (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA5007
02570      1007   1950    1975    1976    2000    1976        9        0.000      300.0
02580    0.95060122                                  0.52        -0.65
02590    1950            57.40           51.65
02600    1951            54.90           53.79
02610    1952            59.20           56.01
02620    1953            59.20           58.29
02630    1954            59.20           60.64
02640    1955            68.60           63.07
02650    1956            65.80           65.57
02660    1957            67.20           68.15
02670    1958            63.40           70.81
02680    1959            69.90           73.54
02690    1960            72.50           76.36
02700    1961            69.60           79.26
02710    1962            75.80           82.25
02720    1963            80.90           85.33
02730    1964            84.70           88.50
02740    1965            92.40           91.76
02750    1966            95.60           95.11
02760    1967            96.50           98.56
02770    1968           106.30          102.11
02780    1969           110.20          105.77
02790    1970           107.00          109.52
02800    1971           118.20          113.39
02810    1972           130.20          117.36
02820    1973           138.10          121.44
02830    1974           125.30          125.64
02840    1975           126.00          129.95
02850    1976             0.00          129.98
02860    1977             0.00          138.53
02870    1978             0.00          144.98
02880    1979             0.00          150.79
02890    1980             0.00          157.46
02900    1981             0.00          163.71
02910    1982             0.00          169.77
02920    1983             0.00          175.94
02930    1984             0.00          182.44
02940    1985             0.00          189.11
02950    1986             0.00          195.62
02960    1987             0.00          202.29
02970    1988             0.00          209.32
02980    1989             0.00          216.51
02990    1990             0.00          223.20
03000    1991             0.00          230.13
03010    1992             0.00          237.33
03020    1993             0.00          244.71
03030    1994             0.00          252.25
03040    1995             0.00          260.05
03050    1996             0.00          268.12
03060    1997             0.00          276.36
03070    1998             0.00          284.94
03080    1999             0.00          293.69
03090    2000             0.00          302.70
```

Baseline Scenario R (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 11. Use of Telecommunications Reduces the Amount of All Travel by 20 Percent.

The principal impact of this event would be exerted on the variable cost elements (e.g., fuel, personnel costs, etc.) which account for approximately 35 percent of the PCE for transportation. A 20 percent reduction in these variable costs would result in a 7 percent reduction in the PCE for transportation. Increased discretionary travel will tend to offset some of the ultimate gain, and a 5 percent decrease in the PCE for transportation is assumed. It is also assumed that a period of a decade will be needed to adjust to these new patterns of communication.

Event 47. More Than 10,000 Miles of the Interstate Highway System Are Electrified and Automated to Accommodate Dual-Mode Automobiles.

It is assumed that a system like this will be at least partially funded by the use of appropriate vehicular taxes and road tolls and other governmental funds. Therefore, the total cost of the system would not be reflected in the PCE for transportation. If 10 percent of all vehicles were assumed to have dual-mode capabilities and the additional costs and outlays averaged $100 a year, then the impact on the variable would be almost a 1 percent increase.

Event 57. $10 Billion Per Year of Government Funds Are Devoted to Urban Transit System Development (Approximately $2 Billion in 1974).

Increased urban transit system development will attenuate private transportation usage. Since most alternate mode decision factors are time-elastic rather than cost-elastic, and this level of expenditures would most likely decrease trip time, there would be a substitution of public transportation for private transportation. This substitution will cause decreases in the PCE for transportation because of the inherent cost advantages of mass transportation. These time-elastic relationships cannot be calculated on an aggregate level, and a nominal 3 percent reduction in PCE for transportation is assigned to reflect the changes in the spending patterns. A maximum impact of ten years is assigned to reflect the time between funding and system development.

Event 67. The Prices of All Prime Energy Sources Are Totally Deregulated.

The deregulation of energy prices will result in increased costs for fuels. The level of the increase is sectorially dependent; i.e., dependent upon the energy source. However, the direct relationship between the increase in the costs of energy and the PCE for transportation is obscured by the uncertainties of the price-elastic relationships over various price ranges. The main energy sector which would influence this indicator is petroleum products, and it is assumed that this relationship is relatively inelastic. If the price of gasoline increases by 50 percent as a result of this event and approximately 25 percent of the PCE for transportation

is cost of gasoline and oil, it is assumed that there will be a 10 percent increase in the PCE. The maximum impact will be realized as prices climb steadily over a period of several (five) years.

Event 89. Federal Funds Are Withheld in Order to Stop Urban Expressway Construction.

This will result in the increased use of mass transit because of difficulties in vehicular access to cities. There will also be the tendency to relocate within the urban area or along mass transit corridors in order to take advantage of mass transit because of the relative cost advantages. The change from private vehicles to public transportation will result in a reduction in the expenditures for transportation, since mass transit systems will be more economical per passenger mile. A -2 percent impact is assigned.

Event 95. Half of All U.S. Employees Have 30 Days of Work Vacation and 15 Scheduled Holidays.

If one-half of all U.S. employees have 30 days of work vacation, it will represent approximately a doubling of current levels of vacation time. This would stimulate pleasure travel. An increase in transportation expenditures of about $50 per employee with such a lengthened vacation will result in an approximate 2 percent increase in the variable.

Event 171. OPEC Dissolves.

The dissolution of OPEC will result in lower prices for oil, which will lower the PCE for transportation. If the event causes a reduction in prices of gasoline of 20 percent, and if gasoline and oil comprise about 20 percent of the PCE for transportation, the net impact on the variable will be approximately -5 percent. The effect of OPEC dissolution on prices will not be immediate but will take place over a period of a few years, during which the decline in gasoline prices will be realized.

```
03100   -19PCE FOR TRANSPORTATION (GOODS AND SERVICES) SCENERIO A
03110   -2  7777 4       4  5 10     -2.000 10     -2.000 1
03120    04     4    PP*     809000     *     013040 /
03130   104     4HOME AND WORK ARE HIGHLY MIXED SO THAT AVERAGE
03140   114     4ONE-WAY TRAVEL IS REDUCED FROM ABOUT 8 MILES
03150   124     4TO 4 MILES.
03160   -2  7777 4      11  2 10     -5.000 10     -5.000 1
03170    04    11    PP*     809000     *     055070
03180   104    11USE OF TELECOMMUNICATIONS REDUCES THE AMOUNT OF
03190   114    11ALL TRAVEL BY 20 PERCENT.
03200   -2  7777 4      27  2  4     -2.000  4     -2.000 1
03210    04    27    PP*     809000     *     012030
03220   104    27FIVE PERCENT OF THE WORK FORCE ACCOMPLISHES ITS
03230   114    27JOB FUNCTIONS THROUGH THE USE OF ELECTRONIC
03240   124    27COMMUNICATION.
03290   -2  7777 4      29  5 10     -5.000 10     -5.000 1
03300    04    29    PP*     809000     *     015060
03310   104    29CAR LIFETIMES ARE EXTENDED TO DOUBLE 1976
03320   114    29EXPECTED VALUES.
03430   -2  7777 4      47  4 10      1.000 10      1.000 1
03440    04    47    PP*     809000     *     011020
03450   104    47MORE THAN 10,000 MILES OF THE INTERSTATE HIGH-
03460   114    47WAY ARE ELECTRIFIED AND AUTOMATED TO ACCOMMODATE DUAL-
03470   124    47MODE AUTOMOBILES.
03540   -2  7777 4      57  2 10     -3.000 10     -3.000 1
03550    04    57    PP*     809000     *     016075
03560   104    57$10 BILLION PER YEAR OF GOV'T FUNDS ARE DEVOTED TO
03565   114    57URBAN TRANSIT SYSTEM DEVELOPMENT (APPROX. $2 BILLION
03570   124    57IN 1974).
03610   -2  7777 4      67  1  5     10.000  5     10.000 1
03620    04    67    PP*     809000     *     051015
03630   104    67THE PRICES OF ALL PRIME ENERGY SOURCES ARE
03640   114    67TOTALLY DEREGULATED.
03740   -2  7777 4      83  3  6     -5.000  6     -5.000 1
03750    04    83    PP*     809000     *     014060
03760   104    83CAR-POOLING FOR TRAVEL TO WORK BECOMES MANDATORY.
03770   -2  7777 4      89  2  5     -2.000  5     -2.000 1
03780    04    89    PP*     809000     *     205070
03790   104    89FEDERAL FUNDS ARE WITHHELD IN ORDER TO STOP URBAN
03800   114    89EXPRESSWAY CONSTRUCTION.
03870   -2  7777 4      95  1  2      2.000  2      2.000 1
03880    04    95    PP*     809000     *     014080
03890   104    95HALF OF ALL U.S. EMPLOYEES HAVE 30 DAYS OF WORK
03900   114    95VACATION AND 15 SCHEDULED HOLIDAYS.
03910   -2  7777 4     171  1  5     -5.000  5     -5.000 1
03920    04   171    PP*     809000     *     051520
03930   104   171OPEC DISSOLVES
03950   -2  7777 4     154  1  5      3.000  5      3.000 1
03960    04   154    PP*     809000     *     013040
03970   104   154INDUSTRY DIFFICULTIES AND FOREIGN PRESSURES FORCE
03980   114   154THE PRICE OF FOSSIL ENERGY TO RISE TO THE OIL
03990   124   154EQUIVALENT OF $20 PER BARREL IN REAL TERMS.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Personal Consumption Expenditures for Recreation (Goods and Services)

BASELINE

In order to insure consistency with total personal consumption expenditures, the baseline for the PCE for recreation was derived by regressing the variable against total PCE.

The regression equation was

PCE for recreation = -11.3 + 0.00773(total PCE)

Scenario-dependent projections of the total PCE were derived from the regression of total PCE against gross national product (see discussion of total PCE, p. 29), and five baselines for the PCE for recreation were projected. In this way the behavior of the baseline of the recreation component of the total PCE was made consistent with the fundamental economic movement of each scenario. Perturbations about these separate baselines were then made by the TIA analysis for each scenario.

Regression Equation

```
SPSS:>LEAS FPCER FFPCE


POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y)                  FPCER = PCE FOR RECREATION
INDEPENDENT VARIABLE (X)                FFPCE = PCE
                                                (1975 DOLLARS, 1950-1974)
NUMBER OF OBSERVATIONS                      25
DETERMINAT OF THE INVERSE MATRIX      1.000E+00

POLYNOMIAL REGRESSION OF DEGREE  1

POLYNOMIAL      CORRELATION     REGRESSION      STD.ERROR       COMPUTED
DEGREE IN X       X VS Y        COEFFICIENT     OF REG.COEF     T VALUE

   1              0.9826         .73022E-02      .28759E-03      25.391

REGRESSION INTERCEPT            -11.299
MULTIPLE CORRELATION             .98263
STD. ERROR OF ESTIMATE           2.4719
COEFF OF DETERMINATION           .96555
```

```
FA1009
00010      1009   1950   1975   1976   2000   1976      14      0.000     245.000
00020    0.94957418                          0.02          -2.27
00030    1950          23.30          19.24
00040    1951          23.60          20.25
00050    1952          23.80          21.30
00060    1953          24.10          22.40
00070    1954          24.50          23.56
00080    1955          26.00          24.77
00090    1956          27.10          26.03
00100    1957          26.40          27.35
00110    1958          26.20          28.73
00120    1959          27.80          30.17
00130    1960          28.50          31.67
00140    1961          28.90          33.23
00150    1962          30.60          34.85
00160    1963          32.50          36.55
00170    1964          34.30          38.31
00180    1965          36.90          40.13
00190    1966          41.80          42.03
00200    1967          43.60          44.00
00210    1968          46.20          46.04
00220    1969          48.20          48.15
00230    1970          50.70          50.33
00240    1971          51.40          52.59
00250    1972          56.60          54.92
00260    1973          62.40          57.32
00270    1974          65.00          59.79
00280    1975          66.00          62.33
00290    1976           0.00          59.42
00300    1977           0.00          62.41
00310    1978           0.00          64.77
00320    1979           0.00          66.99
00330    1980           0.00          68.99
00340    1981           0.00          70.77
00350    1982           0.00          72.51
00360    1983           0.00          74.15
00370    1984           0.00          75.71
00380    1985           0.00          76.96
00390    1986           0.00          78.11
00400    1987           0.00          79.09
00410    1988           0.00          79.98
00420    1989           0.00          80.91
00430    1990           0.00          81.80
00440    1991           0.00          82.74
00450    1992           0.00          83.72
00460    1993           0.00          84.65
00470    1994           0.00          85.63
00480    1995           0.00          86.39
00490    1996           0.00          87.20
00500    1997           0.00          87.95
00510    1998           0.00          88.75
00520    1999           0.00          89.55
00530    2000           0.00          90.35
```

Baseline Scenario A (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA2009
00010      1009   1950   1975   1976   2000   1976      14      0.000     245.000
00020    0.94857418                              0.02          -2.27
00030      1950          23.30          19.24
00040      1951          23.60          20.25
00050      1952          23.90          21.30
00060      1953          24.10          22.40
00070      1954          24.50          23.56
00080      1955          26.00          24.77
00090      1956          27.10          26.03
00100      1957          26.40          27.35
00110      1958          26.20          28.73
00120      1959          27.80          30.17
00130      1960          28.50          31.67
00140      1961          28.90          33.23
00150      1962          30.60          34.85
00160      1963          32.50          36.55
00170      1964          34.30          38.31
00180      1965          36.90          40.13
00190      1966          41.80          42.03
00200      1967          43.60          44.00
00210      1968          46.20          46.04
00220      1969          48.20          48.15
00230      1970          50.70          50.33
00240      1971          51.40          52.59
00250      1972          56.60          54.92
00260      1973          62.40          57.32
00270      1974          65.00          59.79
00280      1975          66.00          62.33
00290      1976           0.00          59.42
00300      1977           0.00          63.83
00310      1978           0.00          67.43
00320      1979           0.00          71.13
00330      1980           0.00          74.95
00340      1981           0.00          78.74
00350      1982           0.00          82.69
00360      1983           0.00          86.84
00370      1984           0.00          91.15
00380      1985           0.00          95.69
00390      1986           0.00         100.80
00400      1987           0.00         106.19
00410      1988           0.00         111.84
00420      1989           0.00         118.02
00430      1990           0.00         124.48
00440      1991           0.00         131.28
00450      1992           0.00         138.72
00460      1993           0.00         146.50
00470      1994           0.00         154.73
00480      1995           0.00         163.36
00490      1996           0.00         172.44
00500      1997           0.00         182.00
00510      1998           0.00         192.32
00520      1999           0.00         202.65
00530      2000           0.00         213.78
```

Baseline Scenario B (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA3009
00010      1009   1950   1975   1976   2000   1976      14       0.000     245.0
00020    0.94857418                          0.02          -2.27
00030    1950          23.30          19.24
00040    1951          23.60          20.25
00050    1952          23.80          21.30
00060    1953          24.10          22.40
00070    1954          24.50          23.56
00080    1955          26.00          24.77
00090    1956          27.10          26.03
00100    1957          26.40          27.35
00110    1958          26.20          28.73
00120    1959          27.80          30.17
00130    1960          28.50          31.67
00140    1961          28.90          33.23
00150    1962          30.60          34.85
00160    1963          32.50          36.55
00170    1964          34.30          38.31
00180    1965          36.90          40.13
00190    1966          41.80          42.03
00200    1967          43.60          44.00
00210    1968          46.20          46.04
00220    1969          48.20          48.15
00230    1970          50.70          50.33
00240    1971          51.40          52.59
00250    1972          56.60          54.92
00260    1973          62.40          57.32
00270    1974          65.00          59.79
00280    1975          66.00          62.33
00290    1976           0.00          59.42
00300    1977           0.00          63.83
00310    1978           0.00          67.43
00320    1979           0.00          71.13
00330    1980           0.00          74.95
00340    1981           0.00          78.65
00350    1982           0.00          82.52
00360    1983           0.00          86.52
00370    1984           0.00          90.79
00380    1985           0.00          95.15
00390    1986           0.00         100.05
00400    1987           0.00         105.21
00410    1988           0.00         110.55
00420    1989           0.00         116.42
00430    1990           0.00         122.56
00440    1991           0.00         128.97
00450    1992           0.00         136.00
00460    1993           0.00         143.38
00470    1994           0.00         151.08
00480    1995           0.00         159.22
00490    1996           0.00         167.77
00500    1997           0.00         176.71
00510    1998           0.00         186.15
00520    1999           0.00         196.03
00530    2000           0.00         206.39
```

Baseline Scenario C (billions of 1975 dollars)

(See p. 2.4 for
to the data.)

```
FA4009
00010      1009   1950   1975   1976   2000   1976      14      0.000     245.000
00020  0.94857418                                  0.02        -2.27
00030  1950          23.30          19.24
00040  1951          23.60          20.25
00050  1952          23.80          21.30
00060  1953          24.10          22.40
00070  1954          24.50          23.56
00080  1955          26.00          24.77
00090  1956          27.10          26.03
00100  1957          26.40          27.35
00110  1958          26.20          28.73
00120  1959          27.80          30.17
00130  1960          28.50          31.67
00140  1961          28.90          33.23
00150  1962          30.60          34.95
00160  1963          32.50          36.55
00170  1964          34.30          38.31
00180  1965          36.90          40.13
00190  1966          41.80          42.03
00200  1967          43.60          44.00
00210  1968          46.20          46.04
00220  1969          48.20          48.15
00230  1970          50.70          50.33
00240  1971          51.40          52.59
00250  1972          56.60          54.92
00260  1973          62.40          57.32
00270  1974          65.00          59.79
00280  1975          66.00          62.33
00290  1976           0.00          59.42
00300  1977           0.00          62.41
00310  1978           0.00          64.77
00320  1979           0.00          66.73
00330  1980           0.00          68.77
00340  1981           0.00          70.86
00350  1982           0.00          72.91
00360  1983           0.00          74.91
00370  1984           0.00          76.82
00380  1985           0.00          78.42
00390  1986           0.00          79.85
00400  1987           0.00          81.23
00410  1988           0.00          82.65
00420  1989           0.00          84.03
00430  1990           0.00          85.45
00440  1991           0.00         186.93
00450  1992           0.00          88.39
00460  1993           0.00          89.90
00470  1994           0.00          91.32
00480  1995           0.00          92.66
00490  1996           0.00          94.00
00500  1997           0.00          95.38
00510  1998           0.00          96.66
00520  1999           0.00          97.95
00530  2000           0.00          99.25
```

Baseline Scenario D (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA5009
00010      1009   1950    1975    1976    2000    1976       14        0.000      245.000
00020     0.94857418                                  0.02          -2.27
00030     1950            23.30           19.24
00040     1951            23.60           20.25
00050     1952            23.80           21.30
00060     1953            24.10           22.40
00070     1954            24.50           23.56
00080     1955            26.00           24.77
00090     1956            27.10           26.03
00100     1957            26.40           27.35
00110     1958            26.20           28.73
00120     1959            27.80           30.17
00130     1960            28.50           31.67
00140     1961            28.90           33.23
00150     1962            30.60           34.85
00160     1963            32.50           36.55
00170     1964            34.30           38.31
00180     1965            36.90           40.13
00190     1966            41.60           42.03
00200     1967            43.60           44.00
00210     1968            46.20           45.04
00220     1969            48.20           48.15
00230     1970            50.70           50.33
00240     1971            51.40           52.59
00250     1972            56.60           54.92
00260     1973            62.40           57.32
00270     1974            65.00           59.79
00280     1975            66.00           62.33
00290     1976             0.00           64.95
00300     1977             0.00           67.63
00310     1978             0.00           70.38
00320     1979             0.00           73.20
00330     1980             0.00           76.08
00340     1981             0.00           79.02
00350     1982             0.00           82.02
00360     1983             0.00           85.07
00370     1984             0.00           88.18
00380     1985             0.00           91.34
00390     1986             0.00           94.54
00400     1987             0.00           97.78
00410     1988             0.00          101.06
00420     1989             0.00          104.37
00430     1990             0.00          107.71
00440     1991             0.00          111.07
00450     1992             0.00          114.44
00460     1993             0.00          117.83
00470     1994             0.00          122.16
00480     1995             0.00          126.16
00490     1996             0.00          130.31
00500     1997             0.00          134.53
00510     1998             0.00          138.94
00520     1999             0.00          143.43
00530     2000             0.00          148.05
```

Baseline Scenario R (billions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 67. The Prices of All Energy Products Are Totally Deregulated.

There are several forces working in opposition vis-à-vis this event and PCE for recreation. The goods and services included in PCE for recreation are somewhat energy-intensive, and deregulation of energy products would increase the cost of these components. Also, deregulation of energy products would result in increasing transportation, food, and other costs which would decrease the discretionary income available for recreational goods and services. These forces combine to cause an estimated 8 percent in the PCE for recreation. This estimate is somewhat arbitrary and represents a "best-guess" estimate.

Event 93. The Federal Government Attempts to Restrict the Size of the Labor Force by Adopting Policies to Encourage Early Retirement or Higher Levels of Public Education.

Successful application of such policies would require that living standards are not impaired and that family incomes and retirement incomes are able to support a modest increase in leisure spending. Increasing the number of retirees and the number of young people who are free from labor schedules is, therefore, assumed to increase the amount spent for recreation. In 1985 there will be approximately 36 million people between the ages of 18 and 21 and between 55 and 64 years. The baseline projections for 1985 for PCE for recreation vary from between approximately $80 and $95 billion. If approximately 20 percent of the people in these age groups is not in the labor force, and if these people spend approximately $1 a day extra on recreation, the total impact will be to increase expenditures for recreation by approximately 3 percent. The effect of such policies is assumed to occur in five years.

Event 94. Twenty-Five Percent of the Work Force Does Not Work the Standard Five-Day, Forty-Hour Week.

It is assumed that restructuring of the 40-hour week will increase recreational spending, and a nominal 1 percent increase is assigned to the variable. Six years will be required for changes in work patterns to result in new recreational activities.

Event 95. Half of All U.S. Employees Have 30 Days of Work Vacation and 15 Days of Scheduled Holidays.

This event will provide opportunities for increasing the expenditures on recreation. Half of the labor force projected for the 1980's will be about 50 million people. If they and their families spent an additional $200 a year on recreational activities, the impact on the PCE for recreation would be about 10 percent. This rather substantial increase will come about through changes in patterns of and an increase in recreational spending and the development of new services and offerings in the recreational market. A fairly long period (10 years) will be required to provide substantive changes in recreational patterns because of necessary infrastructural changes.

```
00540   -19PCE FOR RECREATION GOODS AND SERVICES
00550   -2  7777 4       1  0  3      2.000  5      1.000 1
00560    04     1    PP*     809000     *     052040
00570   104     01ESTABLISHMENT OF 10 NEW RESORTS COMPARABLE TO
00580   114     01DISNEY WORLD.
00710   -2  7777 4      67  1  3     -8.000  8     -2.000 1
00720    04    67    PP*     809000     *     051015
00730   104     67THE PRICES OF ALL PRIME ENERGY SOURCES ARE TOTALLY
00740   114     67DEREGULATED.
00750   -2  7777 4      73  2 12      2.000 12      2.000 1
00760    04    73    PP*     809000     *     104050
00770   104     73LEGISLATION PROVIDING A GUARANTEED MINIMUM
00780   114     73ANNUAL INCOME FOR U.S. CITIZENS.
00820   -2  7777 4      93  2  5      3.000  5      3.000 1
00830    04    93    PP*     809000     *     105060
00840   104     93THE FEDERAL GOV'T WILL ATTEMPT TO RESTRICT THE
00850   114     93SIZE OF THE LABOR FORCE BY ADOPTING POLICIES TO
00860   124     93ENCOURAGE EARLY RETIREMENT, MORE EDUCATION, SHORTER
00870   134     93WORKWEEK, ETC.
00820   -2  7777 4      94  1  6      1.000  6      1.000 1
00890    04    94    PP*     809000     *     206050
00900   104     94WIDESPREAD EXPERIMENTATION BEGINS ON THE DEFINITION
00910   114     94OF A WORK WEEK SUCH AS THREE 8-HOUR DAYS, FIVE
00920   124     946 AND A HALF HOUR DAYS OR FLEXIBLE PERIODS WITH
00930   134     94RESPECT TO HOURS OR DAYS WORKED.
00940   -2  7777 4      95  3 10     10.000 10     10.000 1
00950    04    95    PP*     809000     *     014060
00960   104     95HALF OF ALL U.S. EMPLOYEES HAVE 30 DAYS OF WORK
00970   114     95VACATION AND 15 SCHEDULED HOLIDAYS.
00980   -2  7777 4      97  5  8      1.000  8      1.000 1
00990    04    97    PP*     809000     *     406080
01000   104     97MAJOR DECLINE IN THE MIDDLE-CLASS PURSUIT OF
01010   114     97WORK-ORIENTED, ACHIEVEMENT-ORIENTED, ADVANCEMENT-
01020   124     97ORIENTED VALUES.
01030   -2  7777 4     114  2  5      2.000  5      2.000 1
01040    04   114    PP*     809000     *     106080
01050   104    114SCHOOLS TEACH LEISURE SUBJECTS TO YOUNG PEOPLE WHO WILL
01060   114    114PROBABLY GO INTO THE KINDS OF WORK THAT WILL NOT BE
01070   124    114THEIR CENTRAL LIFE INTEREST.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

U.S. Exports to the European Community*

BASELINE

The baseline represents a reasonable fit to the historic data ($R^2 = 0.728$), and with the exception of the year 1974 is very close to historical experience. The economic boom which caused an unprecedented increase in U.S. exports to the European Community in 1974 is interpreted by the fit program to be anomalous, and future export behavior bears close resemblance to the more gradual increases evident during the 1960-1973 period. The 1974 data are included because we believe the recent behavior of this variable should be taken into account.

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*Data for the European Community consist of aggregated values of the United Kingdom, France, and West Germany.

FA1075

00010	1975	1960	1974	1976	2000	1976	14	1.000	45000.000
00020	0.72756140				0.03		-2.78		

00030	1960	5923.30	4406.22
00040	1961	5491.60	4694.61
00050	1962	5551.00	4976.65
00060	1963	5430.40	5315.55
00070	1964	6014.70	5651.93
00080	1965	5824.40	6006.38
00090	1966	5911.40	6379.45
00100	1967	6126.60	6771.67
00110	1968	6312.30	7183.52
00120	1969	6705.30	7615.42
00130	1970	7675.00	8067.76
00140	1971	7221.40	8540.32
00150	1972	7521.30	9034.44
00160	1973	9676.40	9549.95
00170	1974	12499.60	10086.19
00180	1976	0.00	11221.70
00190	1977	0.00	11820.51
00200	1978	0.00	12439.51
00210	1979	0.00	13078.34
00220	1980	0.00	13735.73
00230	1981	0.00	14411.46
00240	1982	0.00	15104.36
00250	1983	0.00	15813.37
00260	1984	0.00	16537.24
00270	1985	0.00	17274.63
00280	1986	0.00	18024.09
00290	1987	0.00	18784.93
00300	1988	0.00	19552.79
00310	1989	0.00	20328.61
00320	1990	0.00	21109.68
00330	1991	0.00	21894.13
00340	1992	0.00	22630.05
00350	1993	0.00	23465.54
00360	1994	0.00	24248.67
00370	1995	0.00	25027.57
00380	1996	0.00	25800.38
00390	1997	0.00	26565.31
00400	1998	0.00	27320.65
00410	1999	0.00	28064.77
00420	2000	0.00	28796.14

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The impact of commodity cartels on U.S. exports to the European Community is essentially a function of the depressing effects on GNP likely to result from cartel actions for these important minerals. The European Community is approximately 45 percent self-sufficient in bauxite, but imports a vast proportion of its consumption of manganese, tin, and chromium. These are important minerals for developed country economies generally. The 7 percent negative impact on U.S. exports to the European Community is therefore a measure of the declining demand for goods and services throughout European economies likely to result from the depressive effects of cartel action. The effect is likely to be transitory; Department of Interior studies on the effects of cartel actions for chromium and bauxite on the U.S. economy indicate a fairly rapid supply response to price increases, with the effect that over a period of approximately 4-5 years the cost imposed on the economy begins to decline. This substitution effect within Europe, plus the probable displacement of LDC commodity exports to the European Community by U.S. exports to Europe of such commodities as bauxite and manganese, are likely to achieve a steady state impact of -1 percent after approximately 8 years.

Event 171. OPEC Dissolves.

Dissolution of OPEC and a return of global prices to the long-term supply price--perhaps between $6 and $8 per barrel--is likely to have an immediate and positive impact on European growth, and therefore on demand for U.S. products. Substantially lower petroleum import costs are likely to reduce inflation in Europe, permit more expansionary economic policies on the parts of various European governments, reduce pressure on European balance of payments and balance of trade, and generally improve the climate of economic relationships among the major OECD countries. The estimated 12 percent maximum impact is based upon historical experience, specifically the level of increase in U.S. exports to Europe associated with substantial increases in the level of European GNP growth. For example, the large growth in European GNP during the 1969-1970 period was associated with an increase of U.S. exports to the European Community of approximately 12.6 percent in 1974 dollars. The years to maximum impact of approximately 4 years reflects the interval necessary for governments to adjust their economic policies toward more expansionary measures, while the reduction in steady state impact to 8 percent reflects the negative effects of petroleum price decreases on future U.K. export revenues likely to be available as North Sea oil comes onstream.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

This is an unprecedented event for which historical data is not particularly useful. The creation of prohibitively high tariffs, non-tariff

barriers, and investment restrictions by definition erodes the competitiveness of U.S. products in foreign markets and achieves domestic substitution by forcing importers to seek goods either from domestic manufacturers or from other foreign suppliers. The decline in exports here of 30 percent is likely to exceed the decline associated with the 1958 recession, which was a period also associated with high trade and investment restrictions, prior to the 1963 Kennedy-round negotiation in the GATT which achieved substantial tariff reductions. The gradual decline in steady state impact to 25 percent reflects the likelihood that importers of certain products crucial to European economies will likely be given some sort of special import licenses to purchase those American products.

Event 174. United States and Other Developed Countries Negotiate Multi-Lateral Agreements with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations and Stable Export Earnings for Producing Nations.

The impact of this event on U.S. exports to the European Community is somewhat similar to the impacts of the cartel event, in that both have the effect of raising prices on imported raw material from the less-developed country commodity exporters. In this case, however, the degree of price increase is likely to be less severe, and the possibility for complete cut-off of raw materials is limited by the willingness of developed countries to agree on price supports for those raw materials which are exported. Therefore the maximum impact of minus 4 percent is considerably less than is the case with the cartel event. At the same time, the years to steady state impact are lengthened by virtue of the fact that the price increases associated with this event are not likely to be sufficient to bring forth the kind of supply response or substitution effects which we saw in the case of the cartel event. Furthermore, this probable lack, or at least the sluggishness, of the supply response is likely to result in a more enduring effect on the European demand for U.S. products than is the case with the cartel event.

Event 191. EC Negotiates a Series of Preferential Trade Agreements with OPEC Countries Embodying Preferred EC Access to OPEC Crude Oil at Below World Prices and OPEC Discrimination in Favor of EC Exports in Exchange for EC Technology, Technical Assistance, and Lower Tariffs on OPEC Manufactured Products.

An EC-OPEC agreement providing the European Community with preferred access to OPEC crude oil at below world market prices could have a fairly substantial effect on U.S. exports to the European Community. The effects will largely be felt through the ability of European manufacturers to utilize less expensive crude oil and thereby to make various products in which crude oil is important, more competitive domestically against imports from the United States. Since traditionally European manufacturers have had to overcome higher energy prices in competing against U.S. products, this event would amount to a substantial reversal in the cost of inputs to European manufactured products and therefore significantly improve the relative competitiveness of European against American products. A negative impact of 12 percent on U.S. exports is estimated. While there is no

historical precedent for such a decline, under other circumstances--specifically the 1958-1959 depression--U.S. exports to the European Community fell approximately 8.8 percent in 1974 dollars. It should take approximately 3 years for lower OPEC prices to begin showing up in the final prices of European products; the years to maximum impact will be 14 as the effect of access to lower-priced OPEC crude oil gradually makes its way through the entire European economic system; it will take another five years to a steady state impact of -6 percent as alternate U.S. energy sources compensate to a certain extent for the EC-OPEC agreement.

Event 197. Development of North Sea Oil and Natural Gas and Further Growth in Nuclear Power in France, the United Kingdom, Italy, and West Germany Enable Europe to Supply 65 Percent of Its Energy Needs.

The general effects of significantly increased petroleum from the North Sea and significant growth in nuclear power would be to contribute importantly to European economic growth, enable European governments to pursue much more expansionary fiscal and monetary policies, remove some of the political and economic incentives for import controls, and generally to improve the economic climate in Europe as well as the demand for imported products. The accumulative effects of these results can be substantial and are estimated in this case at approximately +10 percent. Again, there is no particular historic precedent for this estimate, and therefore it is a rough estimate only. However, it is not inconsistent with certain periods in U.S.-European trade: for instance, the growth in U.S. exports of 9.7 percent between 1963 and 1964; 12.6 percent between 1969 and 1970; and 22 percent between 1972 and 1973. The maximum impact of 10 percent is assumed to occur at approximately 6 years. The decline to a steady state impact of 7 in 3 years reflects the relative decline in the amount of energy available for export as European economies use more petroleum and nuclear fuel. This will impinge negatively on the European balance of payments and might conceivably result in a resumption of restrictive trade and investment policies.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment.

The effect of Japanese technological parity or superiority in these very important export products would be to erode the U.S. market position in Europe for the same products. The Japanese are, in fact, aggressively marketing new data processing systems in Europe, are entrenched in the European automobile market, are actively engaged in research on the electric car, and are well advanced in the area of pollution abatement equipment. Given the historical experience of successful Japanese export penetration of both the United States and Europe, this is likely to have a negative

effect on the U.S. export base in the European Community. Since U.S. technology is also progressing during the period, the negative effect is not likely to be very large, and the estimate of -3 percent impact is the result. The four years to first impact reflect the amount of time it may take for European importers to shift suppliers for these products. The effect of these innovations on the U.S. market position in Europe will be gradual, since the relative improvements over American products are likely to be incremental. The maximum impact is also likely to be the steady state impact.

```
00430   -1US EXPORTS TO EC  SCENERIO  A
00440   -2  7777 4      51  1  3    -7.000  4    -1.000 1
00450    04     51    PP*     809000     *     257090
00460   104     51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00470   114     51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124     51CHROMIUM.
00510   -2  7777 4      72  6 22    -3.000 22    -3.000 1
00520    04     72    PP*     809000     *     304050
00530   104     72ANTI-EXODUS LAWS ARE PASSED PENALIZING INDUSTRY
00540   114     72FOR MOVING OUTSIDE THE UNITED STATES.
00580   -2  7777 4     171  1  4    12.000  6     8.000 1
00590    04    171    PP*     809000     *     051520
00600   104    171OPEC DISSOLVES.
00610   -2  7777 4     172  1  3   -30.000  7   -25.000 1
00620    04    172    PP*     809000     *     102030
00630   104    172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00633   114    172TRADE AND INVESTMENT RESTRICTIONS WHICH
00636   124    172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00640   -2  7777 4     174  3  5    -4.000 12    -3.000 1
00650    04    174    PP*     809000     *     151520
00660   104    174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00662   114    174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00664   124    174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00666   134    174CONSUMER NATIONS, AND STABLE EXPORT
00668   144    174EARNINGS FOR PRODUCING NATIONS.
00670   -2  7777 4     190  1  7     8.000  7     8.000 1
00680    04    190    PP*     809000     *     050510
00690   104    190EUROPEAN COMMUNITY (EC) ACHIEVES A MONETARY
00692   114    190UNION WITH CURRENCY PARITIES ESTABLISHED
00694   124    190BY THE COUNCIL, AND FURTHER FLUCTUATIONS ARE
00696   134    190CONTROLLED BY A CENTRAL EUROPEAN BANK.
00700   -2  7777 4     191  3 14   -12.000 19    -4.000 1
00710    04    191    PP*     809000     *     303540
00720   104    191EC NEGOTIATES A SERIES OF PREFERENTIAL TRADE
00721   114    191AGREEMENTS WITH OPEC COUNTRIES EMBODYING
00722   124    191PREFERRED EC ACCESS TO OPEC CRUDE OIL AT
00723   134    191BELOW WORLD PRICES AND OPEC DISCRIMINATION
00724   144    191IN FAVOR OF EC EXPORTS, IN EXCHANGE FOR EC
00725   154    191TECHNOLOGY, TECHNICAL ASSISTANCE AND LOWER
00726   164    191TARIFFS ON OPEC MANUFACTURED PRODUCTS.
00730   -2  7777 4     192  2  4     3.000  6     1.000 1
00740    04    192    PP*     809000     *     305065
00750   104    192EC COHESION DIMINISHES AS MONETARY COOPERATION -
00752   114    192THE JOINT FLOAT - FAILS, THE COMMISSION
00754   124    192LOSES ALL INITIATIVE, AND THE CUSTOMS UNION
00756   134    192DISSOLVES, AS EC MEMBERS UNILATERALLY RAISE
00758   144    192TARIFFS AGAINST EACH OTHER'S EXPORTS.
00760   -2  7777 4     193  3  9    -7.000  9    -7.000 1
00770    04    193    PP*     809000     *     253545
00790   104    193COMMUNIST PARTIES IN ITALY, SPAIN, PORTUGAL
00792   114    193AND FRANCE BECOME DOMINANT FORCES IN LEFT OF
00794   124    193CENTER GOVERNING COALITIONS, AND THE LABOR
00796   134    193PARTY IN THE UK COMES UNDER THE CONTROL OF ITS
00798   144    193LEFT WING.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

```
00790   -2  7777 4     194  3 18    -3.000 18    -3.000 1
00800    04   194     PP*     809000     *     050510
00810   104   194THE EC EXPANDS TO INCLUDE, AS FORMAL MEMBERS,
00813   114   194PORTUGAL, SPAIN, GREECE, AUSTRIA, SWITZERLAND,
00816   124   194YUGOSLAVIA AND NORWAY.
00820   -2  7777 4     195  2  4     4.000  7     1.000 1
00830    04   195     PP*     809000     *     101015
00840   104   195THE OECD FINANCIAL SUPPORT FUND BECOMES OPERA-
00842   114   195TIONAL, LENDING AT LOW INTEREST RATES TO ANY OECD
00844   124   195COUNTRY SUFFERING BALANCE OF PAYMENTS DEFICITS FRO
00846   134   195PETROLEUM IMPORTS.
00850   -2  7777 4     197  2  6    10.000  9     7.000 1
00860    04   197     PP*     809000     *     012535
00870   104   197DEVELOPMENT OF NORTH SEA OIL AND NATURAL GAS,
00872   114   197AND FURTHER GROWTH IN NUCLEAR POWER IN FRANCE
00874   124   197, THE UNITED KINGDOM, ITALY AND WEST GERMANY
00876   134   197ENABLE EUROPE TO SUPPLY 55 PERCENT OF ITS
00878   144   197ENERGY NEEDS.
00880   -2  7777 4     215  2  9     3.000 13    2.000 1
00890    04   215     PP*     809000     *     153050
00900   104   215JAPAN AND THE EC BECOME INVOLVED IN A TRADE WAR INVOLVI
00903   114   215G COMPETITIVE DEVALUATIONS OF CURRENCY, TRADE AND INVEST
00906   124   215MENT RESTRICTIONS.
00910   -2  7777 4     217  4 17    -3.000 17    -3.000 1
00920    04   217     PP*     809000     *     053545
00930   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATION
00940   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PROC
00950   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQU
00960   134   217IPMENT.
```

TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

U.S. Imports from the European Community

BASELINE

The baseline represents a good fit to the historical data of $R^2 = 0.88$. The projection is very close to the historical experience during the 1963-1973 period, and the fit program implicitly assumes that the dramatically higher 1974 value is anomalous. Thus, the baseline projection depicts a gradual increase in U.S. imports from the EC commensurate with modest year-to-year demand increases from GNP growth. The 1974 data are included because we believe the most recent behavior of this variable should be taken into account.

```
FA1076
00010       1075    1960    1974    1976    2000    1975      1      0.000   10000.000
00020     0.88334490                              678.84      -39057.44
00030     1960        3892.00        1662.95
00040     1961        3627.90        2341.79
00050     1962        3776.30        3020.63
00060     1963        3800.10        3699.47
00070     1964        4033.90        4378.31
00080     1965        4611.50        5057.15
00090     1966        5669.50        5735.99
00100     1967        5690.40        6414.83
00110     1968        6997.50        7093.67
00120     1969        6561.40        7772.51
00130     1970        7073.10        8451.35
00140     1971        7919.20        9130.19
00150     1972        9122.20        9809.03
00160     1973       10804.00       10437.37
00170     1974       12642.60       11166.71
00180     1976           0.00       12524.39
00190     1977           0.00       13203.23
00200     1978           0.00       13882.07
00210     1979           0.00       14560.91
00220     1980           0.00       15239.75
00230     1981           0.00       15918.59
00240     1982           0.00       16597.43
00250     1983           0.00       17276.27
00260     1984           0.00       17955.11
00270     1985           0.00       18633.95
00280     1986           0.00       19312.79
00290     1987           0.00       19991.63
00300     1988           0.00       20670.47
00310     1989           0.00       21349.31
00320     1990           0.00       22028.15
00330     1991           0.00       22706.99
00340     1992           0.00       23385.83
00350     1993           0.00       24064.67
00360     1994           0.00       24743.51
00370     1995           0.00       25422.35
00380     1996           0.00       26101.19
00390     1997           0.00       26780.03
00400     1998           0.00       27458.87
00410     1999           0.00       28137.71
00420     2000           0.00       28816.55
```

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

Essentially the same forces are at work here as were evident in the relationship between this event and U.S. exports to the EC. In this case, however, the United States has access to aluminite ores which could be developed as bauxite prices rose in response to the resource cartel. In addition, the United States has superior technology for the exploitation of manganese nodules in the deep seabed, and this technology is both available and likely to result in significant increments in manganese production in the event of a manganese cartel. Therefore, the maximum impact is likely to be both less severe and more transitory than is the case with slack European demand resulting from resource cartels, and a decrease of 8 percent diminishing to zero in seven years is the estimated impact.

Event 171. OPEC Dissolves.

The forces at play here resemble those associated with the relationship between OPEC dissolution and U.S. exports to the European Community. One would expect more expansionary government economic policy, lower rates of inflation, and generally increased demand for both domestic and foreign products. The explanation for the somewhat lesser impact here than in the case of U.S. exports is the fact that the United States is currently less dependent upon imports of OPEC crude than is the EC, and therefore the increment in demand likely to result from a dissolution of OPEC is slightly less than is the case with the European Community. The estimate of 12 percent as a maximum impact is consistent with the large increases in U.S. imports from the European Community between 1970 and 1971.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

In this case the assumption is that the United States will retaliate in response to European Community and Japanese restrictive trade practices by erecting its own series of trade and investment restrictions. Given the history of free trade in the United States, the reaction is likely to be somewhat less severe than the initial action on the part of the Europeans and the Japanese. However, the same forces are operating here, and the effect of course would be to substantially impinge upon the competitiveness of Japanese and European products in the U.S. market. The estimate of 23 percent maximum impact has no specific historical precedent, but it is believed to reflect the severity of this event.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations and Stable Export Earnings for Producing Nations.

The forces operating in this case are the same which caused the negative impact of commodity cartels on U.S. exports to the EC. Specifically, the

effects are likely to include a slightly higher rate of inflation, followed by more restrictive government economic policies and a slackening of economic growth with a resulting decline in demand for domestic and foreign products. However, the impacts of this event on U.S. imports from Europe are somewhat less than are the impacts on European imports of U.S. products, since the United States is relatively less vulnerable to increased prices of imported raw materials. Therefore, the effects on U.S. demand for foreign products is estimated to be a negative 3 percent. Furthermore, there will likely be a more immediate and more successful supply response within the United States to the increased import prices for certain raw materials. A 10-year time frame is therefore selected to steady state impact with an increase to a negative 2 percent impact.

Event 191. EC Negotiates a Series of Preferential Trade Agreements with OPEC Countries Embodying Preferred EC Access to OPEC Crude Oil at Below World Prices and OPEC Discrimination in Favor of EC Exports in Exchange for EC Technology, Technical Assistance, and Lower Tariffs on OPEC Manufactured Products.

The effect of preferred EC access to OPEC crude oil at below world prices will be to make certain EC exports more competitive in the U.S. market. Such exports as steel, aluminum, and ultimately certain consumer products are likely to benefit significantly from the lower cost production inputs implied in this event. Since traditionally energy prices have been somewhat higher in Europe than in the United States, the reversal of this trend suggests that the result in terms of EC competitiveness might be quite significant. The positive impact of 8 percent, while not based on any specific historical precedent, seems reasonable considering the larger increases in European exports to the United States between 1967 and 1968 and between 1972 and 1973. The years to first impact reflect the amount of time it would probably take for the effects of access to lower cost petroleum to work its way through to domestic production and export prices of products exported to the U.S. market. The impact of 8 percent will fall off during the next 7 years to a steady state impact of 4 percent as U.S. offshore and Alaskan petroleum and other energy sources come onstream, which would tend to compensate for the initial European advantage.

Event 197. Development of North Sea Oil and Natural Gas and Further Growth in Nuclear Power in France, the United Kingdom, Italy, and West Germany Enable Europe to Supply 65 Percent of Its Energy Needs.

The essential forces at work in this event in stimulating EC exports to the United States are similar to those in operation for NAS Event 191. The essential difference is in the immediacy of effect, in that a certain increment in North Sea petroleum will most likely be immediately available for export to the United States. However, the bulk of the impact of +9 percent reflects the benefits to a broad range of European manufacturers available through their access to lower cost European petroleum, natural gas, and nuclear power.

```
00430   -19US IMPORTS FROM EC  SCENERIO  A
00440   -2  7777 4      51  1  3     -3.000  7      0.000 1
00450    04     51    PP*     809000     *     257030
00460   104     51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00476   114     51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124     51CHROMIUM.
00510   -2  7777 4     171  1  5    12.000  7      8.000 1

00520    04    171    PP*     809000     *     051520
00530   104    171OPEC DISSOLVES
00540   -2  7777 4     172  2  4   -23.000  8    -20.000 1
00550    04    172    PP*     809000     *     102030
00560   104    172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00563   114    172TRADE AND INVESTMENT RESTRICTIONS WHICH
00566   124    172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00570   -2  7777 4     174  3  5    -3.000 10     -2.000 1
00580    04    174    PP*     809000     *     151520
00590   104    174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00592   114    174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00594   124    174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00596   134    174CONSUMER NATIONS, AND STABLE EXPORT
00598   144    174EARNINGS FOR PRODUCING NATIONS.
00600   -2  7777 4     191  4 12     3.000 19      4.000 1
00610    04    191    PP*     809000     *     300540
00620   114    191AGREEMENTS WITH OPEC COUNTRIES EMBODYING
00621   124    191PREFERRED EC ACCESS TO OPEC CRUDE OIL AT
00622   134    191BELOW WORLD PRICES AND OPEC DISCRIMINATION
00623   144    191IN FAVOR OF EC EXPORTS, IN EXCHANGE FOR EC
00624   154    191TECHNOLOGY, TECHNICAL ASSISTANCE AND LOWER
00625   164    191TARIFFS ON OPEC MANUFACTURED PRODUCTS.
00630   -2  7777 4     192  3  9    -7.000  9     -7.000 1
00640    04    192    PP*     809000     *     305065
00650   104    192EC COHESION DIMINISHES AS MONETARY COOPERATION -
00652   114    192THE JOINT FLOAT - FAILS, THE COMMISSION
00654   124    192LOSES ALL INITIATIVE, AND THE CUSTOMS UNION
00656   134    192DISSOLVES, AS EC MEMBERS UNILATERALLY RAISE
00658   144    192TARIFFS AGAINST EACH OTHER'S EXPORTS.
00660   -2  7777 4     193  4 11   -12.000 11    -12.000 1
00670    04    193    PP*     809000     *     253545
00680   104    193COMMUNIST PARTIES IN ITALY, SPAIN, PORTUGAL
00682   114    193AND FRANCE BECOME DOMINANT FORCES IN LEFT OF
00684   124    193CENTER GOVERNING COALITIONS, AND THE LABOR
00686   134    193PARTY IN THE UK COMES UNDER THE CONTROL OF ITS
00688   144    193LEFT WING.
00690   -2  7777 4     194  3  6     2.000  9      1.000 1
00700    04    194    PP*     809000     *     050510
00710   104    194THE EC EXPANDS TO INCLUDE, AS FORMAL MEMBERS,
00713   114    194PORTUGAL, SPAIN, GREECE, AUSTRIA, SWITZERLAND,
00716   124    194YUGOSLAVIA AND NORWAY.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

```
00720   -2  7777 4     195  2  3      2.000  5      1.000 1
00730    04    195     PP*     809000     *     101015
00740   104    195THE OECD FINANCIAL SUPPORT FUND BECOMES OPERA-
00742   114    195TIONAL, LENDING AT LOW INTEREST RATES TO ANY OECD
00744   124    195COUNTRY SUFFERING BALANCE OF PAYMENTS DEFICITS FROM
00746   134    195PETROLEUM IMPORTS.
00750   -2  7777 4     197  2  9      9.000 15      7.000 1
00760    04    197     PP*     809000     *     012535
00770   104    197DEVELOPMENT OF NORTH SEA OIL AND NATURAL GAS,
00772   114    197AND FURTHER GROWTH IN NUCLEAR POWER IN FRANCE
00774   124    197, THE UNITED KINGDOM, ITALY AND WEST GERMANY
00776   134    197ENABLE EUROPE TO SUPPLY 65 PERCENT OF ITS
00778   144    197ENERGY NEEDS.
00780   -2  7777 4     215  2  6      3.000  6      3.000 1
00790    04    215     PP*     809000     *     153060
00800   104    215JAPAN AND THE EC BECOME INVOLVED IN A TRADE WAR INVOLVIN
00900   114    215G COMPETITIVE DEVALUATIONS OF CURRENCY, TRADE AND INVEST
01000   124    215MENT RESTRICTIONS.
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TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

U.S. Investments in the European Community

BASELINE

This baseline provides an almost perfect fit to the historical data ($R^2 = 0.986$). It depicts a constant significant year-to-year increase in U.S. investments which closely reflect historical experience. That experience suggests that investment policies are relatively insensitive to fluctuations in economic activity and relatively more responsive to perceptions of future opportunity and foreign government investment policies. Since such policies should become progressively less restrictive, future increases in U.S. investment is a sensible expectation.

FA1077

00010	1077	1960	1974	1976	2000	1976	10	0.000	85000.000
00020	0.98603796				-152.08		6.42		
00030	1960		7969.30	7756.81					
00040	1961		8243.40	8535.64					
00050	1962		9638.80	9363.72					
00060	1963		10602.30	10241.99					
00070	1964		11314.00	11171.30					
00080	1965		12309.10	12152.41					
00090	1966		13089.90	13186.00					
00100	1967		14173.30	14272.68					
00110	1968		14704.10	15412.98					
00120	1969		15548.50	16607.34					
00130	1970		16877.80	17856.13					
00140	1971		18764.90	19159.65					
00150	1972		20236.30	20518.14					
00160	1973		23163.90	21931.75					
00170	1974		25410.00	23400.58					
00180	1976		0.00	26503.94					
00190	1977		0.00	28138.36					
00200	1978		0.00	29827.77					
00210	1979		0.00	31571.97					
00220	1980		0.00	33379.72					
00230	1981		0.00	35223.72					
00240	1982		0.00	37130.65					
00250	1983		0.00	39091.12					
00260	1984		0.00	41104.71					
00270	1985		0.00	43170.97					
00280	1986		0.00	45289.42					
00290	1987		0.00	47459.52					
00300	1988		0.00	49680.74					
00310	1989		0.00	51952.48					
00320	1990		0.00	54274.15					
00330	1991		0.00	56645.12					
00340	1992		0.00	59064.73					
00350	1993		0.00	61532.33					
00360	1994		0.00	64047.22					
00370	1995		0.00	66608.70					
00380	1996		0.00	69216.05					
00390	1997		0.00	71868.54					
00400	1998		0.00	74565.43					
00410	1999		0.00	77305.97					
00420	2000		0.00	80089.40					

Baseline (millions of 1974 dollars)

(See p. 2.4 for key
to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

U.S. investments in the European Community exhibit an uninterrupted increase during the past 20 years. It would appear, based upon historic data, that investments may be relatively less sensitive to swings in economic activity than to government policies designed to stimulate or to restrict investments. Therefore, the impact of cartelization of certain key raw materials on investments is not likely to be particularly large. The effect here is a function of the general decline in economic activity in Europe which is likely to result from cartel activity, as well as the possibility of U.S. government intervention designed to maximize investments domestically. This suggests a maximum impact of -4 percent. The impact whould be felt relatively quickly with the maximum impact declining over a 6-year period to a steady state impact of -1, since the economic effects of cartels are apt to be rather transitory. This is based upon the assumption that there will be a supply response in developed countries as new investment opportunities in alternate resources and/or substitutes are created.

Event 171. OPEC Dissolves.

Again, the effect of dissolution of OPEC will be felt largely in terms of generally increased levels of economic activity on both sides of the Atlantic, a generally less restrictive investment climate on both sides, a freeing up of investment funds currently going into new energy and other raw material sources, as well as the creation of new investment opportunities in certain countries which were heavy importers of petroleum. On the other hand, the impact would be greater were it not for the negative effects of an OPEC dissolution on the United Kingdom, whose investments in North Sea oil would suddenly become uneconomic. Therefore, the main hope for the United Kingdom in ultimately escaping from its present balance of payments and general economic malaise would likely be vitiated by dissolution of OPEC. Furthermore, the investment opportunities existing in the United States as a result of this event are likely to be very compelling for potential investors. These factors have led us to a maximum impact of +5%, with a slight falling off to 4% after 12 years.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

By definition, the effect of this event is highly significant. Since the event represents administrative action, the effect, which is estimated at -30%, would also be immediate, although it is quite likely that during an interim period of approximately two years a certain amount of investment will continue to flow. Furthermore, the capital requirements of certain EC industries would argue for continued allowance for certain incoming capital through the period.

Event 191. EC Negotiates a Series of Preferential Trade Agreements with OPEC Countries Embodying Preferred EC Access to OPEC Crude Oil at Below World Prices and OPEC Discrimination in Favor of EC Exports in Exchange for EC Technology, Technical Assistance, and Lower Tariffs on OPEC Manufactured Products.

The essential impact of special EC access to OPEC crude oil at below world market prices is to make the European Community a much more attractive investment climate for potential U.S. investors. The likely response on the part of U.S. investors would be to locate manufacturing facilities in the European Community in order to take advantage of access to less expensive raw material inputs. This in turn would make U.S. products manufactured in Europe more competitive both within Europe as well as in world markets, including the U.S. market. This logic suggests a maximum impact of +7 percent. However, these advantages are likely to be transitory, as new U.S. domestic sources of petroleum, natural gas, and nuclear energy come onstream during the latter part of the period, reducing the steady state impact to +3 percent.

Event 197. Development of North Sea Oil and Natural Gas and Further Growth in Nuclear Power in France, the United Kingdom, Italy, and West Germany Enable Europe to Supply 65 Percent of Its Energy Needs.

The effect of this event on U.S. investments in the European Community is quite similar to that ascribed to the EC-OPEC preferential trade agreement. The impact should be essentially the same, in that U.S. investors who locate manufacturing facilities in Europe will enjoy the benefits of lower-priced petroleum and nuclear power, in terms of the competitiveness of their products both within Europe and in foreign markets, including the U.S. market. However, the effects are apt to be more lasting here than with respect to the OPEC event since these energy sources will of course be more stable, and thus the competitive advantages which they confer on any manufacturer's access to them are likely to be more durable. Again, the maximum impact of 7 percent represents an important but not unprecedented increase in the level of investment in a single year.

```
00430   -19U.S. INVESTMENTS IN E.C.  SCENERIO A
00440   -2  7777 4      51  2  4     -4.000 10     -1.000 1
00450    04    51    PP*     809000     *     257090
00460   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00476   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124    51CHROMIUM.
00510   -2  7777 4      72  1  6     -6.000 12     -4.000 1
00520    04    72    PP*     809000     *     304050
00530   104    72ANTI-EXODUS LAWS ARE PASSED PENALIZING U.S.
00540   114    72INDUSTRY FOR MOVING ITS OPERATION OUTSIDE THE U.S.
00560   -2  7777 4     171  1  5      5.000 12      4.000 1
00590    04   171    PP*     809000     *     051520
00600   104   171OPEC DISSOLVES

00610   -2  7777 4     172  1  3    -30.000  7    -25.000 1
00620    04   172    PP*     809000     *     102030
00630   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00633   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00636   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00640   -2  7777 4     190  2  6      4.000 10      3.000 1
00650    04   190    PP*     809000     *     050510
00660   104   190EUROPEAN COMMUNITY (EC) ACHIEVES A MONETARY
00662   114   190UNION WITH CURRENCY PARITIES ESTABLISHED
00664   124   190BY THE COUNCIL, AND FURTHER FLUCTUATIONS ARE
00666   134   190CONTROLLED BY A CENTRAL EUROPEAN BANK.
00670   -2  7777 4     191  3  6      7.000 15      3.000 1
00680    04   191    PP*     809000     *     305540
00690   114   191AGREEMENTS WITH OPEC COUNTRIES EMBODYING
00691   124   191PREFERRED EC ACCESS TO OPEC CRUDE OIL AT
00692   134   191BELOW WORLD PRICES AND OPEC DISCRIMINATION
00693   144   191IN FAVOR OF EC EXPORTS, IN EXCHANGE FOR EC
00694   154   191TECHNOLOGY, TECHNICAL ASSISTANCE AND LOWER
00695   164   191TARIFFS ON OPEC MANUFACTURED PRODUCTS.
00700   -2  7777 4     192  2 14     -7.000 14     -7.000 1
00710    04   192    PP*     809000     *     305065
00720   104   192EC COHESION DIMINISHES AS MONETARY COOPERATION -
00722   114   192THE JOINT FLOAT - FAILS, THE COMMISSION
00724   124   192LOSES ALL INITIATIVE, AND THE CUSTOMS UNION
00726   134   192DISSOLVES, AS EC MEMBERS UNILATERALLY RAISE
00728   144   192TARIFFS AGAINST EACH OTHER'S EXPORTS.
00730   -2  7777 4     193  1  7     -9.000 16     -6.000 1
00740    04   193    PP*     809000     *     253545
00750   104   193COMMUNIST PARTIES IN ITALY, SPAIN, PORTUGAL
00752   114   193AND FRANCE BECOME DOMINANT FORCES IN LEFT OF
00754   124   193CENTER GOVERNING COALITIONS, AND THE LABOR
00756   134   193PARTY IN THE UK COMES UNDER THE CONTROL OF ITS
00758   144   193LEFT WING.
00760   -2  7777 4     194  4  9      3.000  9      3.000 1
00770    04   194    PP*     809000     *     050510
00780   104   194THE EC EXPANDS TO INCLUDE, AS FORMAL MEMBERS,
00783   114   194PORTUGAL, SPAIN, GREECE, AUSTRIA, SWITZERLAND,
00786   124   194YUGOSLAVIA AND NORWAY.
00790   -2  7777 4     195  3  5      2.000  8      0.000 1
00800    04   195    PP*     809000     *     101015
00810   104   195THE OECD FINANCIAL SUPPORT FUND BECOMES OPERA-
00812   114   195TIONAL, LENDING AT LOW INTEREST RATES TO ANY OECD
00814   124   195COUNTRY SUFFERING BALANCE OF PAYMENTS DEFICITS FROM
00816   134   195PETROLEUM IMPORTS.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

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ALTERNATIVE FUTURE SCENARIOS FOR THE NATIONAL AVIATION SYSTEM, --ETC(U)
FEB 77 E FEIN, C DONAHUE, M OPPENHEIMER DOT-FA76WA-3855
UNCLASSIFIED 276-72-05/03 NL

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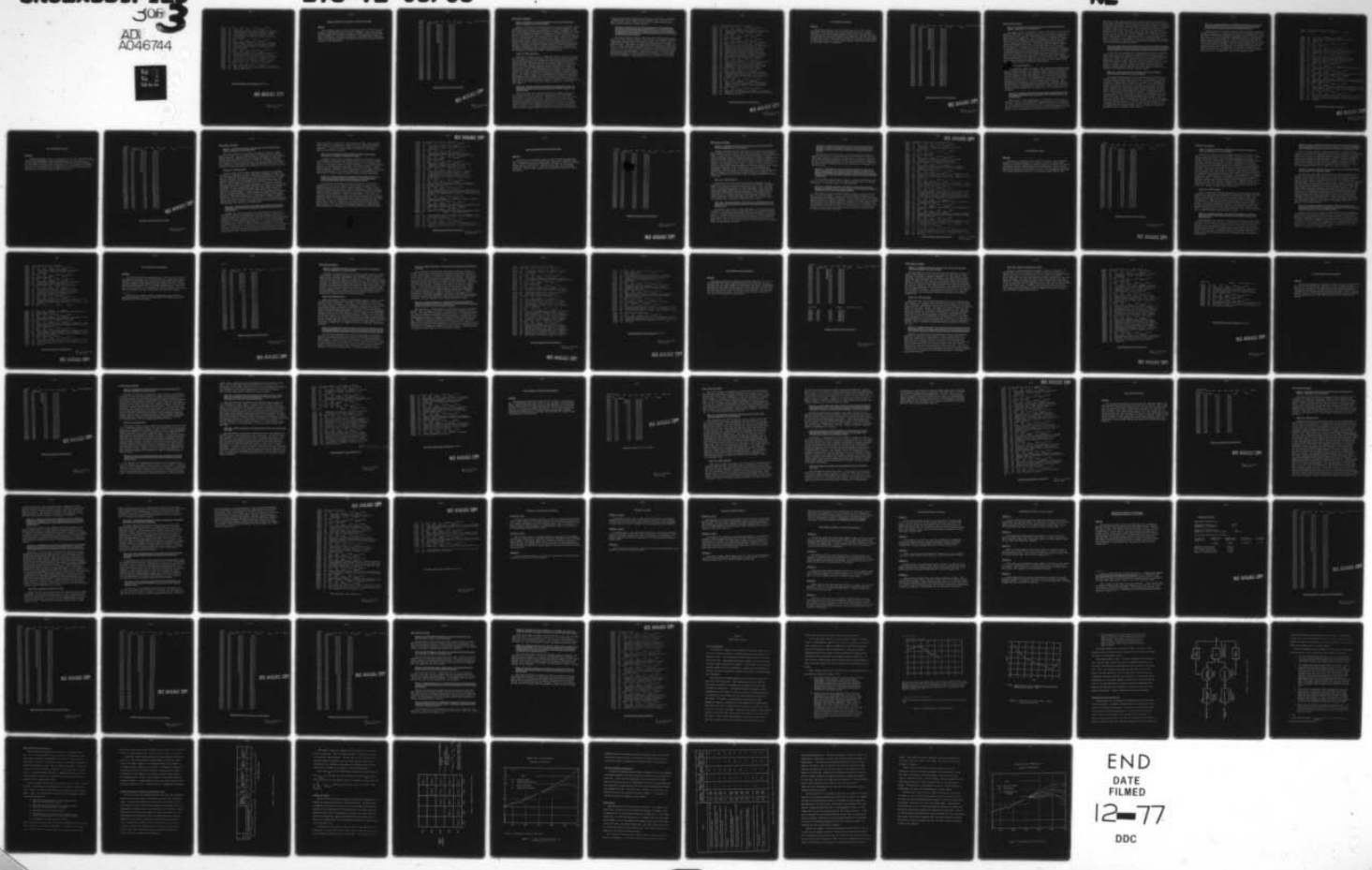

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00820   -2  7777 4    196  2  8      5.000 13     3.000 1
00830    04   196    PP*     809000     *     304050
00840   104   196DECD NEGOTIATES A MANDATORY CODE OF CONDUCT FOR
00841   114   196MULTINATIONAL CORPORATIONS ASSURING NATIONAL
00842   124   196TREATMENT FOR ALL MNC'S, PROTECTION AGAINST
00843   134   196EXPROPRIATION, AND FORCED MODIFICATION OF
00844   144   196AGREEMENTS, AND PROHIBITING POLITICAL ACTIVITY
00845   154   196 BY MNC'S
00850   -2  7777 4    197  2  5      7.000  9     5.000 1
00860    04   197    PP*     809000     *     012535
00870   104   197DEVELOPMENT OF NORTH SEA OIL AND NATURAL GAS,
00872   114   197AND FURTHER GROWTH IN NUCLEAR POWER IN FRANCE
00874   124   197, THE UNITED KINGDOM, ITALY AND WEST GERMANY
00876   134   197ENABLE EUROPE TO SUPPLY 65 PERCENT OF ITS
00878   144   197ENERGY NEEDS.
00880   -2  7777 4    201  4  9      2.000 14     1.000 1
00890    04   201    PP*     809000     *     254055
00900   104   201LATIN AMERICAN GOVERNMENTS ADOPT LEGISLATION TO
00901   114   201ACQUIRE MAJORITY OWNERSHIP OF ALL FOREIGN
00902   124   201ENTERPRISES, FOR ALL MULTINATIONAL CORPORATIONS
00903   134   201(MNC'S) TO EXPORT AT LEAST ONE-THIRD OF THEIR
00904   144   201PRODUCTION, TO LIMIT MNC'S REPARTITION OF
00905   154   201CAPITAL, AND TO REQUIRE ALL LOCALLY PRODUCED
00906   164   201GOODS TO CONTAIN 75 PERCENT LOCAL CONTENT.
00910   -2  7777 4    205  4  9     -2.000 14    -1.000 1
00920    04   205    PP*     809000     *     101520
00930   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
01030   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
01130   124   205GOODS AND CAPITAL.
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TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

European Community Investments in the United States

BASELINE

This baseline yielded a fit to the historical data of $R^2 = 0.94$, indicating a close parallel with historical experience. Those data indicate a steady, significant increase in European investments in the United States. This is reflected in the baseline projection. The assumption is that continued elimination of investment restrictions and equalization of production costs in the European Community and the United States will stimulate further increases in EC investments.

FA1078									
00010	1078	1962	1974	1976	2000	1975	14	1.000	40000.000
00020	0.94432603					0.03	-3.14		
00030	1962		3990.00		3372.72				
00040	1963		3914.80		3621.61				
00050	1964		4105.80		3886.93				
00060	1965		4100.10		4169.46				
00070	1966		4114.60		4469.98				
00080	1967		4532.50		4789.25				
00090	1968		4769.90		5128.05				
00100	1969		5071.40		5487.09				
00110	1970		5647.80		5867.03				
00120	1971		6417.10		6258.50				
00130	1972		6582.10		6692.05				
00140	1973		6999.20		7138.18				
00150	1974		8085.00		7607.24				
00160	1976		0.00		8615.21				
00170	1977		0.00		9154.30				
00180	1978		0.00		9716.68				
00190	1979		0.00		10302.05				
00200	1980		0.00		10910.01				
00210	1981		0.00		11539.90				
00220	1982		0.00		12190.91				
00230	1983		0.00		12852.04				
00240	1984		0.00		13552.12				
00250	1985		0.00		14259.77				
00260	1986		0.00		14983.44				
00270	1987		0.00		15721.40				
00280	1988		0.00		16471.78				
00290	1989		0.00		17232.55				
00300	1990		0.00		18001.57				
00310	1991		0.00		18776.61				
00320	1992		0.00		19555.36				
00330	1993		0.00		20335.45				
00340	1994		0.00		21114.53				
00350	1995		0.00		21890.23				
00360	1996		0.00		22660.23				
00370	1997		0.00		23422.29				
00380	1998		0.00		24174.24				
00390	1999		0.00		24914.06				
00400	2000		0.00		25639.84				

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

European investments in the United States are currently relatively small, considerably less than are U.S. investments in the European Community, and have increased only modestly during the past ten years. Therefore, the impact of cartelization on European investments in the United States is probably not going to approach the impact of cartelization on U.S. investments in Europe. While the general decline in economic activity likely to be associated with cartelization is apt to diminish the economic incentives for investments in this country, there is a countervailing force in that certain investment opportunities, particularly in alternate raw materials such as alumina ores, might become more attractive for investors, both domestic and European. Therefore, a relatively modest impact of -3 percent is estimated. The impact following the first 4 years should decline to a -1 percent as alternative raw material sources weaken the effects of the cartel and there is a resumption of historical levels of economic activity.

Event 171. OPEC Dissolves.

This event is liable to have a significant impact on the level of European investment in the United States. The dissolution of OPEC is likely to free up significant amounts of investment funds currently being directed by both European governments and business into certain European extractive energy industries. The opportunities for European investors in the United States will likely expand as well, as certain traditional U.S. heavy industries such as steel and automobiles enjoy a resurgence as a result of lower petroleum costs. This combination of incentives, plus the general increase in the pace of economic activity and the general healthier economic climate, are likely to result in a substantial increase in European investments. The 8 percent figure is not inconsistent with historical experience: for example, the 10.2 percent increase in European investment in the United States between 1966 and 1967; the 11.4 percent increase between 1969 and 1970; and the 13.6 percent increase between 1970 and 1971. The maximum impact, which should occur after seven years, should be identical to the steady state impact.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

This event could have a substantial impact on European investments in the United States, since some U.S. retaliation for EC investment restrictions is a virtual certainty. On the other hand, there are likely to be certain industries which are so dependent upon increased capital investments, or whose future capital requirements are likely to be sufficiently dependent upon foreign investors, that the likely U.S. response would probably not be as completely restrictive as the European restrictions. In effect, a U.S. response to this event would be selectively restrictive and is thus not likely to have the enormous impact on investment

flows that the European restrictions are likely to call forth. Therefore, a maximum impact of -9 percent has been estimated, with a decline to 5 percent after 14 years to allow for an erosion of these restrictions as their counterproductivity becomes manifest.

Event 191. EC Negotiates a Series of Preferential Trade Agreements with OPEC Countries Embodying Preferred EC Access to OPEC Crude Oil at Below World Prices and OPEC Discrimination in Favor of EC Exports in Exchange for EC Technology, Technical Assistance, and Lower Tariffs on OPEC Manufactured Products.

The special European access to OPEC crude oil at below market prices, which is the most important element in this event, would enhance investment opportunities within Europe, since access to lower-cost crude oil would permit European manufacturers to produce and export products at highly competitive prices. The special advantage which the agreement with OPEC confers is likely therefore to increase the level of investments within Europe as well as attract a certain amount of investment which heretofore had been directed at the American market. Furthermore, the nature of U.S.-European relationships given this event is likely to deteriorate to the point that European investments in the United States will be relatively less welcome by the U.S. government. These factors lead to an estimate of -3 percent.

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00410   -19EC INVESTMENTS IN THE US  SCENERIO  A
00420   -2  7777 4      51  2  4     -3.000 10     -1.000 1
00430    04    51    PP*     809000     *     257090
00440   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00456   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00472   124    51CHROMIUM.
00490   -2  7777 4     171  1  7     8.000  7     8.000 1
00500    04   171    PP*     809000     *     051520
00510   104   171OPEC DISSOLVES
00520   -2  7777 4     172  2  8     -9.000 14     -5.000 1
00530    04   172    PP*     809000     *     102030
00540   104   172EEC AND JAPAN TRADE AND INVESTMENT BARRIERS.
00550   -2  7777 4     191  4  7     -3.000 13     -2.000 1
00560   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00563   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00566   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00570   114   191AGREEMENTS WITH OPEC COUNTRIES EMBODYING
00571   124   191PREFERRED EC ACCESS TO OPEC CRUDE OIL AT
00572   134   191BELOW WORLD PRICES AND OPEC DISCRIMINATION
00573   144   191IN FAVOR OF EC EXPORTS, IN EXCHANGE FOR EC
00574   154   191TECHNOLOGY, TECHNICAL ASSISTANCE AND LOWER
00575   164   191TARIFFS ON OPEC MANUFACTURED PRODUCTS.
00580   -2  7777 4     192  1  9     -3.000  9     -2.000 1
00590    04   192    PP*     809000     *     305055
00600   104   192EC COHESION DIMINISHES AS MONETARY COOPERATION -
00602   114   192THE JOINT FLOAT - FAILS, THE COMMISSION
00604   124   192LOSES ALL INITIATIVE, AND THE CUSTOMS UNION
00606   134   192DISSOLVES, AS EC MEMBERS UNILATERALLY RAISE
00608   144   192TARIFFS AGAINST EACH OTHER'S EXPORTS.
00610   -2  7777 4     193  1  6    -12.000 11     -9.000 1
00620    04   193    PP*     809000     *     253545
00630   104   193COMMUNIST PARTIES IN ITALY, SPAIN, PORTUGAL
00632   114   193AND FRANCE BECOME DOMINANT FORCES IN LEFT OF
00634   124   193CENTER GOVERNING COALITIONS, AND THE LABOR
00636   134   193PARTY IN THE UK COMES UNDER THE CONTROL OF ITS
00638   144   193LEFT WING.
00640   -2  7777 4     196  1  5     -9.000 12     -5.000 1
00650    04   198    PP*     809000     *     405060
00660   104   198THE UNITED KINGDOM AND FRANCE ESTABLISH CUR-
00662   114   198RENCY CONTROLS TO STEM THE FLOW OF INVESTMENT
00664   124   198FUNDS TO OTHER DEVELOPED AND UNDERDEVELOPED
00666   134   198COUNTRIES.
00670   -2  7777 4     205  3  8     -1.000  8     -1.000 1
00680    04   205    PP*     809000     *     101520
00690   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00790   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00890   124   205GOODS AND CAPITAL.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

U.S. Imports from Japan

BASELINE

This baseline yields a fit to the historical data of $R^2 = 0.929$, indicating a close parallel with the historic behavior of U.S. imports from Japan. The baseline departs somewhat from the data during 1973-1974, a period which the fit program assumed to be anomalous. The 1974 data were included because we believe the most recent behavior of this variable should be taken into account. The projection depicts very substantial year-to-year increases with the rate of growth slowing somewhat during the latter period as a saturation point is approached.

FA1091

00010	1091	1960	1974	1976	2000	1975	14	0.000	40000.000
00020	0.92908446					0.05	-3.97		
00030	1960	4102.80	3028.00						
00040	1961	3296.20	3352.07						
00050	1962	3880.00	3707.34						
00060	1963	3840.50	4096.06						
00070	1964	3536.20	4520.46						
00080	1965	5613.50	4982.72						
00090	1966	6440.80	5484.95						
00100	1967	5260.60	6029.09						
00110	1968	6335.00	6615.36						
00120	1969	6884.80	7249.70						
00130	1970	7437.20	7923.70						
00140	1971	8641.40	8654.48						
00150	1972	9063.10	9427.17						
00160	1973	9550.40	10246.29						
00170	1974	12337.60	11110.72						
00180	1976	0.00	12967.42						
00190	1977	0.00	13953.76						
00200	1978	0.00	14973.57						
00210	1979	0.00	16022.06						
00220	1980	0.00	17093.62						
00230	1981	0.00	18182.91						
00240	1982	0.00	19282.98						
00250	1983	0.00	20387.41						
00260	1984	0.00	21489.48						
00270	1985	0.00	22582.53						
00280	1986	0.00	23660.11						
00290	1987	0.00	24716.14						
00300	1988	0.00	25745.05						
00310	1989	0.00	26741.84						
00320	1990	0.00	27702.22						
00330	1991	0.00	28622.64						
00340	1992	0.00	29500.28						
00350	1993	0.00	30333.08						
00360	1994	0.00	31119.71						
00370	1995	0.00	31859.51						
00380	1996	0.00	32552.43						
00390	1997	0.00	33198.96						
00400	1998	0.00	33800.05						
00410	1999	0.00	34357.05						
00420	2000	0.00	34871.60						

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The Japanese export consciousness, as well as the wide array of official government incentives for exporting in Japan, are reflected in almost uninterrupted increases in Japanese exports to the United States regardless of global economic circumstances. This insensitivity of Japanese exports to the United States suggests that even if an important event such as cartelization was to occur, Japanese industry and government would coalesce in order to maintain export markets. Therefore a negative impact of only 5 percent is assigned in this case, as contrasted with the negative impact of 8 percent on U.S. imports from the European Community in the event of cartelization. The decline, of course, reflects a general dimunition in economic activity in the United States, the changed pattern of investment from manufactured products toward certain extractive industries which might provide alternatives to the minerals which are being restricted, as well as a likely reorientation in the Japanese economic policy toward investments in "safe" LDC resource suppliers. As in the case of U.S. imports from the European Community, the effect of this event is likely to be transitory as new substitute and lower grade ores come onstream in the United States and the historic levels of economic activity resumes.

Event 171. OPEC Dissolves.

The dissolution of OPEC is likely to have immediate and profound impact on U.S. imports from Japan. The Japanese, free from their overwhelming dependence on OPEC petroleum, and therefore enjoying substantial benefits from availability of lower cost petroleum, will see their exports become much more competitive in foreign markets. At the same time, the general level of economic activity in the United States will pick up dramatically as there is a resuscitation of traditional U.S. industries that have suffered substantial injury as a result of higher priced petroleum. This combination of developments, plus the effectiveness of Japanese industry and government in spotting and exploiting export opportunities, should result in an impact of approximately a positive 12 percent, which is likely to level off only slightly over the longer term to a positive effect of 10 percent.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The selection of the maximum impact of -25 percent in this case is arbitrary, since of course the event is unprecedented and it is impossible to predict precisely how effective the Japanese restrictions are going to be, or how immediate and restrictive the U.S. retaliation is likely to be. However, there will be American retaliation because the Japanese have tradinally enjoyed a significant trade surplus with the United States, and

therefore the restoration of prohibitive Japanese restriction is likely to be seen much less sympathetically in the United States than is the erection of European restrictions. The retaliation against the Japanese is likely to come in the form of both increased tariff levels and, more likely, the creation of administrative barriers to trade. These barriers are potentially more restrictive than higher tariffs, in that in many cases they absolutely preclude imports, rather than simply making them less competitive in terms of price, as is the case with tariffs. However, it is likely that there will be some decline in the steady state impact to a -18 percent, both because of complaints of U.S. importers who rely on Japanese products as well as the historic effectiveness of the Japanese in evading trade restrictions through various devices such as price-cutting and unilateral redefinitions of voluntary restraint agreements.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations and Stable Export Earnings for Producing Nations.

In this case, the agreement with less-developed countries to stabilize export prices is likely to lead to an inflation of those export prices which should endure until substitutes are found within the importing countries. It is likely to result in a modest decline in economic activity as governments attempt to fight inflation through restrictive fiscal and monetary policies and direct investments into the extractive sector. These factors are likely to induce a decline in Japanese exports to the U.S. market of perhaps 2 percent, although this impact should diminish to 1 percent as economic growth resumes in the various developed countries in response to the exploitation of new sources of supply.

Event 213. Japanese Completely Liberalize Trade and Investment Restrictions on Imports of Goods and Capital.

The Japanese liberalization of trade and investment restrictions is likely to make it much more difficult for the U.S. government to respond to certain domestic protectionist interests by raising trade barriers in response to Japanese export penetration. In effect, this increased lack of diplomatic flexibility will create a freer U.S. trade and investment climate, resulting in substantially increased Japanese exports, particularly in those sectors which are currently heavily protected, including steel, textiles, and other consumer goods; certain sectors of the electronics industry; and certain chemical products. This liberalization of the U.S. trade regime in these sectors will have a substantial impact on Japanese exports to the United States, particularly considering the Japanese effectiveness in penetrating and holding export markets. Thus a positive 6 percent impact is estimated as the effect of the initial Japanese liberalization makes it increasingly difficult for the U.S. government to protect domestic interests. A decline to 5 percent is expected as Japanese market penetration becomes so severe in these sectors that the U.S. government is ultimately called upon to seek voluntary restraint agreements with the Japanese in these sectors.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment.

Japanese exports to the United States of data processing equipment are currently virtually nil. However, their exports of automobiles of course are enormous, and pollution abatement equipment is a growing export sector for Japan. The effect of Japanese technological parity or superiority in these fields will quite likely be an important increase in the Japanese market share in the United States. This is likely to be especially the case in small business computers, mini and micro computers, certain kinds of pollution abatement equipment, and the electric automobile, which will be attractive particularly because of its non-polluting character and utility as a town car. Maximum impact of a positive 2 percent in this case is likely to decline somewhat to a positive 1 percent on the long-term basis as U.S. technology in these fields reasserts itself.

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00430   -19US IMPORTS FROM JAPAN  SCENERIO  A
00440   -2  7777 4     51  1  3    -5.000  5    -1.000 1
00450    04    51    PP*    809000    *    257090
00460   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00476   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124    51CHROMIUM.
00510   -2  7777 4     171  1  5    12.000  7    10.000 1
00520    04   171    PP*    809000    *    051520
00530   104   171OPEC DISSOLVES
00540   -2  7777 4     172  2  4   -25.000  7   -18.000 1
00550    04   172    PP*    809000    *    102030
00560   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00563   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00566   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00570   -2  7777 4     174  3  5    -2.000 10   -1.000 1
00580    04   174    PP*    809000    *    151520
00590   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00592   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00594   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00596   134   174CONSUMER NATIONS, AND STABLE EXPORT
00598   144   174EARNINGS FOR PRODUCING NATIONS.
00600   -2  7777 4     212  4  8    -2.000 12   -1.000 1
00610    04   212    PP*    809000    *    306080
00620   104   212LABOR UNIONS EMERGE AS INDEPENDENT FORCES IN INDUSTRIAL
00625   114   212RELATIONS IN JAPAN.
00630   -2  7777 4     213  3  9     6.000 14    5.000 1
00640    04   213    PP*    809000    *    051015
00650   104   213JAPANESE COMPLETELY LIBERALIZE TRADE AND INVESTMENT REST
00655   114   213RICTIONS ON IMPORTS OF GOODS AND CAPITAL.
00660   -2  7777 4     215  1  5     4.000 14    1.000 1
00670    04   215    PP*    809000    *    153060
00680   104   215JAPAN AND THE EC BECOME INVOLVED IN A TRADE WAR INVOLVIN
00683   114   215G COMPETITIVE DEVALUATIONS OF CURRENCY, TRADE AND INVEST
00686   124   215MENT RESTRICTIONS.
00690   -2  7777 4     216  2  7     2.000 12    1.000 1
00700    04   216    PP*    809000    *    154070
00710   104   216JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EMBODYI
00712   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AND TE
00714   124   216CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRAZIL,
00716   134   216 MEXICO AND VENEZUELA.
00720   -2  7777 4     217  1  6     2.000 13    1.000 1
00730    04   217    PP*    809000    *    053545
00740   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATION,
00840   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PROC
00940   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQU
01040   134   217IPMENT.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

U.S. Investments in Japan

BASELINE

The baseline yields a fit to the historical data of $R^2 = 0.943$ which indicates a close resemblance to historical experience. The major exception is 1974, in which actual investment levels exceed the baseline by over $300 million. The fit program thus implicitly assumed that the 1974 performance is anomalous and that future investments will increase gradually, consistent with the 1960-1973 period. The 1974 data were included because we believe the most recent behavior of this variable should be taken into account.

FA1093									
00010	1093	1960	1974	1976	2000	1976	14	0.000	10000.00
00020	0.94293549					0.05	-3.94		
00030	1960		907.10		822.69				
00040	1961		943.70		910.46				
00050	1962		1065.70		1006.58				
00060	1963		1210.20		1111.60				
00070	1964		1196.00		1226.08				
00080	1965		1569.70		1350.55				
00090	1966		1589.10		1435.54				
00100	1967		1463.10		1631.47				
00110	1968		1570.30		1788.72				
00120	1969		1725.70		1957.58				
00130	1970		1875.90		2136.23				
00140	1971		2277.30		2330.72				
00150	1972		2525.00		2534.95				
00160	1973		2644.50		2750.66				
00170	1974		3319.00		2977.40				
00180	1976		0.00		3451.27				
00190	1977		0.00		3715.55				
00200	1978		0.00		3979.22				
00210	1979		0.00		4247.89				
00220	1980		0.00		4521.06				
00230	1981		0.00		4797.19				
00240	1982		0.00		5074.55				
00250	1983		0.00		5351.44				
00260	1984		0.00		5625.19				
00270	1985		0.00		5897.14				
00280	1986		0.00		6162.76				
00290	1987		0.00		6421.62				
00300	1988		0.00		6672.44				
00310	1989		0.00		6914.14				
00320	1990		0.00		7145.78				
00330	1991		0.00		7366.66				
00340	1992		0.00		7576.25				
00350	1993		0.00		7774.19				
00360	1994		0.00		7960.32				
00370	1995		0.00		8134.62				
00380	1996		0.00		8297.21				
00390	1997		0.00		8448.33				
00400	1998		0.00		8588.33				
00410	1999		0.00		8717.51				
00420	2000		0.00		8830.65				

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The current level of U.S. investment in Japan is relatively modest, largely as a result of the restrictiveness of Japanese policy on foreign direct investment. Therefore the influence of cartelization of key minerals, although likely to diminish the level of economic activity in both Japan and the United States, is not likely to result in a substantial decline in the level of U.S. investment in Japan. The negative impact of 2 percent will diminish to a zero steady state impact as new sources of either these minerals or substitute materials are developed in various supplier countries.

Event 171. OPEC Dissolves.

Japan is likely to be the major beneficiary among all the developed countries of a dissolution of OPEC. Being heavily dependent on OPEC crude oil, the sudden decline in the price of imported petroleum into Japan should result in a dramatic and immediate increase in economic activity. Certain Japanese industries, both heavy industries and manufacturers, which were hard hit by the embargo and subsequent price increases of petroleum, are likely to benefit substantially from this event. In addition, sizeable investment funds which the Japanese government has directed into raw material development in "safe" foreign areas will suddenly be freed up for domestic investments in other manufacturing industries. The general increase in the pace of economic activity is likely to make Japan a very attractive area for foreign investment, as well as result in a generally more conciliatory and cooperative economic climate between Japan and the United States. Therefore, a substantial impact of U.S. investments in Japan is estimated, despite the level of current Japanese restrictions on foreign investors. The positive 6 percent impact is not inconsistent with historical experience associated with U.S. investments in Japan, particularly the periods between 1968 and 1969, 1970 and 1971, and 1973 and 1974.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

Although this event would appear to be catastrophic in terms of U.S. investments in Japan, the current level of restrictions is so high that the creation of even greater prohibitions on foreign investment would have, although important, a somewhat lesser effect than would the impact of European prohibitive trade and investment restrictions on U.S. foreign investments. Presumably, the investments already made by U.S. companies in Japan have been made by virtue of the Japanese government's decision that a certain amount of foreign capital is required for the development of certain Japanese industries. Therefore, it is unlikely that the Japanese government would see fit to sacrifice a substantial portion of these investments, and would therefore most likely make special allowances to retain certain investments

which were crucial to the health of the Japanese economy. Such an event would, however, be a significant rupture in the U.S.-Japanese commercial relationahip, and would certainly significantly diminish the level of investment. A negative 15 percent impact is estimated, diminishing to negative 11 percent in six years.

Event 213. Japanese Completely Liberalize Trade and Investment Restrictions on Imports of Goods and Capital.

A complete liberalization of Japanese investment restrictions would be a monumental change in Japanese investment policy and would very rapidly enhance the attractiveness of the Japanese market for U.S. investors. By virtue of its thriving economy, political stability, and its export potential, Japan is an inherently attractive country for foreign investors. Given a liberalization of investment restrictions, there would be a very immediate and very dramatic increase in a U.S. investment by, we approximate, 20 percent, with a slight decline to 17 percent to allow for a modest resurgence of restrictions in order to protect certain strategic Japanese industries.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment.

The achievement of Japanese technological superiority or parity in these products is likely to stimulate U.S. investment in Japan. This achievement first of all is likely to remove some of the incentive from Japanese protectionist policies on trade and investment, as well as enable a more creditable diplomatic assault from the United States and the European Community against Japanese protectionism, on the basis of the lack of need to protect strong industries. Second, the achievement of this level of technological sophistication is bound to assist in the growth of the entire Japanese economy and therefore make Japan a more attractive area for foreign investment. Third, U.S. manufacturers who had been exporting to Japan in these product areas will likely have to locate manufacturing facilities within Japan in order to minimize transportation costs and maintain their market shares in the face of stiffer Japanese competition. These factors should increase U.S. investments by 3 percent over the baseline projection.

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00430   -19US INVESTMENTS IN JAPAN  SCENERIO  A
00440   -2  7777 4     51  2  4     -2.000  7      0.000 1
00450    04    51    PP*     809000     *     257090
00460   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00476   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124    51CHROMIUM.
00510   -2  7777 4     72  6 17     -4.000 21     -3.000 1
00520    04    72    PP*     809000     *     304050
00530   104    72ANTI-EXODUS LAWS ARE PASSED PENALIZING U.S.
00540   114    72INDUSTRY FOR MOVING ITS OPERATION OUTSIDE THE U.S.
00580   -2  7777 4     171  1  5      6.000  5      5.000 1
00590    04   171    PP*     809000     *     051520
00600   104   171OPEC DISSOLVES
00610   -2  7777 4     172  1  3    -15.000  6    -11.000 1
00620    04   172    PP*     809000     *     102030
00630   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00633   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00636   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00640   -2  7777 4     196  1  5      7.000 11      5.000 1
00650    04   196    PP*     809000     *     304050
00660   104   196OECD NEGOTIATES A MANDATORY CODE OF CONDUCT FOR
00661   114   196MULTINATIONAL CORPORATIONS ASSURING NATIONAL
00662   124   196TREATMENT FOR ALL MNC'S, PROTECTION AGAINST
00663   134   196EXPROPRIATION, AND FORCED MODIFICATION OF
00664   144   196AGREEMENTS, AND PROHIBITING POLITICAL ACTIVITY
00665   154   196 BY MNC'S
00670   -2  7777 4     205  4  9     -1.000 12      0.000 1
00680    04   205    PP*     809000     *     101520
00690   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00693   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00696   124   205GOODS AND CAPITAL.
00700   -2  7777 4     209  1  6     -5.000 11     -4.000 1
00710    04   209    PP*     809000     *     254065
00720   104   209THE JAPANESE SOCIALIST PARTY AND THE JAPANESE COMMUNIST
00722   114   209PARTY GAIN POLITICALLY AT THE EXPENSE OF THE LIBERAL DEM
00724   124   209OCRATS AND BECOME DOMINANT ELEMENTS IN A GOVERNING COALI
00726   134   209TION.
00730   -2  7777 4     212  3  7     -2.000 14     -1.000 1
00740    04   212    PP*     809000     *     306080
00750   104   212LABOR UNIONS EMERGE AS INDEPENDENT FORCES IN INDUSTRIAL
00755   114   212RELATIONS IN JAPAN.
00760   -2  7777 4     213  1  9     20.000 13     17.000 1
00770    04   213    PP*     809000     *     051015
00780   104   213JAPANESE COMPLETELY LIBERALIZE TRADE AND INVESTMENT REST
00785   114   213RICTIONS ON IMPORTS OF GOODS AND CAPITAL.
00790   -2  7777 4     216  3  7      2.000 12      1.000 1
00800    04   216    PP*     809000     *     154070
00810   104   216JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EMBODYI
PAGE 1-48                          FACOMB      TUE 28-DEC-76 5:41

00812   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AND TE
00814   124   216CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRAZIL,
00816   134   216 MEXICO AND VENEZUELA.
00820   -2  7777 4     217  4 12      3.000 19      3.000 1
00830    04   217    PP*     809000     *     053545
00840   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATI--
00940   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PRO-C
01040   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQUI
01140   134   217IPMENT.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Japanese Investments in the United States

BASELINE

A close fit to the historical data for this variable was impossible to derive because of the wide year-to-year fluctuations in Japanese investment. Without the past as a reliable guide, we imposed a limit of $1 billion on the value for the year 2000. Utilizing this limit, the fit program yielded the baseline shown. It depicts a gradual increase in Japanese investments, with the rate of growth declining somewhat toward the end of the period.

FA1094

00010	1094	1962	1974	1976	2000	1976	14	0.000	1000.[illegible]0
00020	0.19653193					0.03	-2.34		
00030	1962	320.00	191.11						
00040	1963	266.60	201.13						
00050	1964	144.00	211.52						
00060	1965	274.40	222.31						
00070	1966	223.90	233.49						
00080	1967	189.40	245.04						
00090	1968	282.80	256.98						
00100	196[illegible]	247.[illegible]0	269.30						
00110	19[illegible]	[illegible].80	281.98						
00120	[illegible]	[illegible].20	295.01						
00130	1972	[illegible].30	308.39						
00140	1973	[illegible]6.40	322.10						
00150	1974	504.00	335.12						
00160	1976	0.00	365.03						
00170	1977	0.00	379.87						
00180	1978	0.00	394.94						
00190	1979	0.00	410.22						
00200	1980	0.00	425.67						
00210	1981	0.00	441.26						
00220	1982	0.00	456.98						
00230	1983	0.00	472.77						
00240	1984	0.00	488.63						
00250	1985	0.00	504.50						
00260	1986	0.00	520.37						
00270	1987	0.00	536.20						
00280	1988	0.00	551.95						
00290	1989	0.00	567.60						
00300	1990	0.00	583.12						
00310	1991	0.00	598.47						
00320	1992	0.00	613.63						
00330	1993	0.00	628.58						
00340	1994	0.00	643.28						
00350	1995	0.00	657.72						
00360	1996	0.00	671.87						
00370	1997	0.00	685.72						
00380	1998	0.00	699.24						
00390	1999	0.00	712.43						
00400	2000	0.00	725.26						

Baseline (millions of 1974 dollars)

(See p. 2.4 for key
to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

Japanese investments in the United States have historically been quite small although over the last four years they have increased substantially. In the event of resource cartels, the Japanese government, which traditionally takes an important role in directing the size and purposes of Japanese private investment abroad, is likely to intervene in order to promote private investment in those countries which offer promise of becoming alternate sources for the minerals being restricted. This conscious government policy, combined with the generally lower level of economic activity, are apt to produce at least modest negative results estimated at 3 percent on the level of Japanese investment in the United States. A countervailing, and ultimately a minimizing force, is the likelihood that new investment opportunities will be created in the United States, for example, in development of aluminite ores, which may ultimately stimulate a resurgence of Japanese investment, with the effect that the steady state impact is likely to be zero.

Event 171. OPEC Dissolves.

In the event of an OPEC dissolution, Japanese investments in the United States are apt to rise very rapidly, and to maintain a relatively high rate of increase throughout the scenario period. There is likely to be a significant freeing up of Japanese investment funds, relatively greater investment opportunities in the United States, particularly in traditional manufacturing and heavy industries, general improvement in the climate of U.S.-Japan economic relationships, and therefore both greater rewards and lesser constraints on the Japanese investment in the United States. The factors should contribute to a positive impact of 9 percent, with a decrease to 6 percent after 14 years.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The impact of this event on Japan investments in the United States is a function of the almost certain retaliation by the U.S. government which is likely to impinge significantly upon Japanese investments in the United States. Of course, given the relatively low level of Japanese investments currently, and the fact that many of these investments are in industries which require them in order to maintain competitiveness domestically, the impact is not likely to be severe, but will, we believe, result in a negative impact of approximately 6 percent.

Event 210. Completion of a Treaty of Peace and Friendship with the PRC Leads to Very Large Japanese Investments in Oil Reserves and Taiching Purchases of More Than 60 Million Tons of Crude Oil From the PRC.

This event is not likely to have a long-term, significant impact on Japanese investments in the United States. While the initial outlay of funds might conceivably diminish the availability of funds for investments in the United States by perhaps 3 percent, the long-term effect would be nil and even conceivably positive to the extent that access to PRC crude oil would benefit the Japanese economy and contribute to an expansion of investment funds.

Event 211. Settlement of the Kuril Islands Dispute with the Soviet Union is Followed by Very Large Japanese Investments in Siberian Raw Material Development--Oil, Gas, and Lumber Primarily--Including Japanese Construction of a Pipeline From Tyomen Oil Fields with Soviet Repayment in Crude Oil.

For the reasons cited above with respect to Japanese investments in the PRC, this event is unlikely to have a long-term adverse impact on Japanese investments, and the same impacts have been estimated.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment.

This event is likely to have contradictory impacts on Japanese investments in the United States. On the one hand, investment opportunities in the industries undergoing innovation will likely increase, therefore drawing increased amounts of Japanese investment. On the other hand, those particular industries which are achieving technological parity will likely become bolder and more effective in investing abroad. Furthermore, a considerable amount of investment in servicing and marketing facilities will be required by these same industries which plan to export to the United States. We believe, as a result of these forces, that a modest positive impact of 2 percent will be achieved in Japanese investments.

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00410   -19JAPANS INVESTMENT IN THE U.S. SCENERIO A
00420   -2  7777 4     51  2  5     -3.000 12      0.000 1
00430    04    51     PP*     809000     *     257090
00440   104    51DEVELOPING COUNTSIES FORM CARTELS FOR KEY RAW
00445   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00472   124    51CHROMIUM.
00480   -2  7777 4     171  1  5     9.000 14      6.000 1
00500    04   171     PP*     809000     *     051520
00510   104   171DEC DISSOLVES
00520   -2  7777 4     172  2  6     -6.000 11     -3.000 1
00530    04   172     PP*     809000     *     102030
00540   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00543   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00546   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00550   -2  7777 4     205  2  6     -2.000  8     -1.000 1
00560    04   205     PP*     809000     *     101520
00570   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00573   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00576   124   205GOODS AND CAPITAL.
00580   -2  7777 4     209  1  5     -5.000  9     -4.000 1
00590    04   209     PP*     809000     *     254065
00600   104   209THE JAPANESE SOCIALIST PARTY AND THE JAPANESE COMMUNIST
00602   114   209PARTY GAIN POLITICALLY AT THE EXPENSE OF THE LIBERAL DEM
00604   124   209OCRATS AND BECOME DOMINANT ELEMENTS IN A GOVERNING COALI
00606   134   209TION.
00610   -2  7777 4     210  3  7     -3.000 11      0.000 1
00620    04   210     PP*     809000     *     017555
00630   104   210COMPLETION OF A TREATY OF PEACE AND FRIENDSHIP WITH THE
00632   114   210PRC LEADS TO VERY LARGE JAPANESE INVESTMENTS IN TAICHING
00634   124   210 OIL RESERVES AND ANNUAL PURCHASES OF MORE THAN 50 MILLI
00635   134   210ON TONS OF CRUDE OIL FROM THE PRC.
00640   -2  7777 4     211  3  7     -3.000 11      0.000 1
00650    04   211     PP*     809000     *     356585
00660   104   211SETTLEMENT OF THE KURIL ISLANDS DISPUTE WITH THE SOVIET
00662   114   211UNION IS FOLLOWED BY VERY LARGE JAPANESE INVESTMENTS IN
00664   124   211 SIBERIAN RAW MATERIAL DEVELOPMENT --OIL, GAS AND LUMBER
00666   134   211 PRIMARILY--INCLUDING JAPANESE CONSTRUCTION OF A PIPELIN
00668   144   211 FROM TYUMEN OIL FIELDS WITH SOVIET REPAYMENTIN CRUDE.
00670   -2  7777 4     212  1  9     2.000 13      1.000 1
00680    04   212     PP*     809000     *     306080
00690   104   212LABOR UNIONS EMERGE AS INDEPENDENT FORCES IN INDUSTRIAL
00695   114   212RELATIONS IN JAPAN.
00700   -2  7777 4     214  1  3     -8.000  8     -6.000 1
00710    04   214     PP*     809000     *     153560
00720   104   214JAPANESE GOVERNMENT ADOPTS CONTROLS ON THE EXPORT OF CAP
00725   114   214ITAL.
00730   -2  7777 4     215  2  5     2.000  9      1.000 1
00740    04   215     PP*     809000     *     153060
00750   104   215JAPAN AND THE EC BECOME INVOLVED IN A TRADE WAR INVOLVIN
00753   114   215G COMPETITIVE DEVALUATIONS OF CURRENCY, TRADE AND INVEST
00756   124   215MENT RESTRICTIONS.
00760   -2  7777 4     216  2  5     -3.000 10     -1.000 1
00770    04   216     PP*     809000     *     154070
00780   104   216JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EXCHANGI
00782   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AND TE
00784   124   216CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRAZIL,
00786   134   216 MEXICO AND VENEZUELA.
00740   -2  7777 4     217  3  7     2.000  7      2.000 1
00800    04   217     PP*     809000     *     053045
00810   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATION
00910   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PROC
01010   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQU
01110   134   217IPMENT.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

U.S. Exports to Japan

BASELINE

Derivation of a baseline with a high R^2 is difficult in this instance because of the high volatility in U.S. exports to Japan. This probably reflects the substantial degree of Japanese government administrative control over imports and the frequent changes in the Government's import policies. The baseline chosen by the computer, with an $R^2 = 0.5089$, depicts significant year-to-year increases in U.S. exports, with an escalating growth rate (from 4.6 percent between 1978 and 1979 to 5.6 percent between 1996 and 1997).

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  FA1092
00010      1092   1960   1974   1976   2000   1976      11        0.000  30
000.000
00020     0.50889497                          -0.00          0.35
00030     1960         5108.50         4199.25
00040     1961         5741.50         4369.29
00050     1962         4496.50         4547.94
00060     1963         4727.10         4735.72.
00070     1964         4018.60         4933.17
00080     1965         4837.40         5140.90
00090     1966         5138.00         5359.52
00100     1967         4729.00         5599.73
00110     1968         4616.00         5832.23
00120     1969         4915.00         6087.82
00130     1970         5888.40         6357.31
00140     1961         4827.10         6641.61
00150     1972         5394.40         6941.67
00160     1973         8230.70         7259.52
00170     1974        10678.50         7593.27
00180     1976            0.00         8321.33
00190     1977            0.00         8717.29
00200     1978            0.00         9136.50
00210     1979            0.00         9590.54
00220     1980            0.00        10051.16
00230     1981            0.00        10550.21
00240     1982            0.00        11079.71
00250     1983            0.00        11641.85
00260     1984            0.00        12239.93
00270     1985            0.00        12873.65
00280     1986            0.00        13548.63
00290     1987            0.00        14266.92
00300     1988            0.00        15031.76
00310     1989            0.00        15846.69
00320     1990            0.00        16715.53
00330     1991            0.00        17642.46
00340     1992            0.00        18632.02
00350     1993            0.00        19689.14
00360     1994            0.00        20819.20
00370     1995            0.00        22028.07
00380     1996            0.00        23322.16
00390     1997            0.00        24708.47
00400     1998            0.00        26194.64
00410     1999            0.00        27789.05.
00420     2000            0.00        29500.87
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Baseline (millions of 1974 dollars)

(See p. 2.4 for key
to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

This event is likely to induce a general decline in the level of economic activity, and therefore in the level of U.S. exports to Japan. Aside from the immediate impact of cartels in these minerals on the level of economic activity in Japan (Japan is entirely dependent upon foreign sources for these minerals), such an event is likely to stimulate the Japanese government into redirecting larger amounts of investment capital toward locating more reliable foreign sources for these minerals, or investing in new technologies to substitute new materials for those which are being restricted. Furthermore, the balance of payments drain created by rapidly escalating prices for these imports is likely to induce greater restrictiveness in Japanese trade policy toward certain developed countries, designed to compensate in the balance of payments area. This combination of results should have a significant effect on Japanese import demand for U.S. products. However, the effect is likely to be transitory, as new U.S. technologies designed to exploit lower grade aluminite ores and manganese nodules in the deep sea come onstream, resulting in increased U.S. exports of these raw materials to Japan. The 8 percent negative impact, although severe, is not inconsistent with certain historical periods, for example, the 22 percent drop in U.S. exports to Japan between 1970 and 1971.

Event 171. OPEC Dissolves.

Since the Japanese are heavily dependent on petroleum imports from OPEC countries, and have plans for substantial investments in alternate petroleum sources, most importantly in the PRC and the Soviet Union as well as in domestic nuclear power, and the level of Japanese economic activity has historically been vulnerable to supply restrictions or price increases for raw materials, an OPEC dissolution should significantly increase import demand on the part of Japanese manufacturers. Such an event is likely also to permit the Japanese government to pursue more expansionary fiscal and monetary policies, and to be less restrictive in its import regime. Therefore, we estimate an impact of positive 12 percent on U.S. exports to Japan, with a slight reduction to 8 percent after 6 years.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The Japanese already maintain a comparatively restrictive import regime, consisting of high tariffs as well as a wide array of non-tariff restrictions. Therefore, while the effect of Japanese prohibitive trade and investment restrictions will be extremely severe, it will not approach the 30 percent negative impact ascribed to European restrictiveness, and we have estimated a maximum impact of -20. The slight decline in the maximum impact to -16 after 7 years reflects the likelihood of special allowances for certain Japanese importers and industries which are dependent upon imports from the United States.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC's, Assuring Access to Raw Materials Supplies for Consumer Nations, and Stable Export Earnings for Producing Nations.

While this event would be somewhat advantageous to Japan by lending stability to its external raw material sources, the disadvantages for developed countries is likely to be somewhat higher prices for imported raw materials, which in turn is likely to decrease somewhat Japanese demand for imported manufactured products from other developed countries. Decreased demands, as well as the potential for more restrictive Japanese trade and investment policies, and domestic economic policies designed to compensate for the greater drain on Japanese resources implied by these agreements, is likely to reduce Japanese demand for U.S. exports by perhaps 5 percent.

Event 213. Japanese Completely Liberalized Trade and Investment Restrictions on Imports of Goods and Capital.

As noted above, the Japanese trade regime is currently characterized by high levels of tariffs and a wide array of non-tariff restrictions. A complete liberalization as described in this event would have a very immediate and dramatic effect on the competitiveness of U.S. products in the Japanese market, which we estimate at +15 percent. Those products which embody high technology, such as computers, communications equipment, certain kinds of transportation equipment, and agriculture equipment and technology, would likely be extremely competitive in a free Japanese marketplace. Not only would Japanese companies dramatically increase their imports from U.S. suppliers, but the freeing up of investment restrictions would result in an increase in U.S.-owned manufacturing facilities in Japan which would also import substantial amounts of goods and services from the United States. A slight decline to a steady state impact of plus 11 is a result of the increased technological sophistication of Japanese industry, particularly in transportation equipment and computers, which would likely reduce somewhat the long-term impact of this event on the competitiveness of U.S. products in the Japanese market.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment.

Since the level of U.S. exports to Japan in these product categories is relatively small compared to overall U.S. trade, and consists largely of exports of data processors and data processing equipment, the impact of Japanese technological sophistication in these fields is relatively modest. U.S. market share of the Japanese computer market, currently approximately 12 percent, is likely to shrink to perhaps half of that given the occurrence of this event. U.S. exports of automobiles and the pollution abatement equipment to Japan are extremely small. Thus we estimate only a negative impact of 1 percent on U.S. exports to Japan.

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00430   -19U.S. EXPORTS TO JAPAN  SCENERIO A
00440   -2  7777 4     51  1  3    -8.000  8    -1.000 1
00450    04    51    PP*    809000    *    257090
00460   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00476   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00492   124    51CHROMIUM.
00510   -2  7777 4     171  1  4    12.000  6     8.000 1
00520    04   171    PP*    809000    *    051520
00530   104   171OPEC DISSOLVES
00540   -2  7777 4     172  1  3   -20.000  7   -15.000 1
00550    04   172    PP*    809000    *    102030
00560   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00563   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00566   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00570   -2  7777 4     174  3  5    -5.000 12    -4.000 1
00580    04   174    PP*    809000    *    151520
00590   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00592   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00594   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00596   134   174CONSUMER NATIONS, AND STABLE EXPORT
00598   144   174EARNINGS FOR PRODUCING NATIONS.
00600   -2  7777 4     209  2  7    -4.000 14    -2.000 1
00610    04   209    PP*    809000    *    254065
00620   104   209THE JAPANESE SOCIALIST PARTY AND THE JAPANESE COMMUNIST
00622   114   209PARTY GAIN POLITICALLY AT THE EXPENSE OF THE LIBERAL DEM
00624   124   209OCRATS AND BECOME DOMINANT ELEMENTS IN A GOVERNING COALI
00626   134   209TION.
00630   -2  7777 4     212  4  8     2.000  8     2.000 1

00640    04   212    PP*    809000    *    306080
00650   104   212LABOR UNIONS EMERGE AS INDEPENDENT FORCES IN INDUSTRIAL
00655   114   212RELATIONS IN JAPAN.
00660   -2  7777 4     213  1  6    15.000 13    11.000 1
00670    04   213    PP*    809000    *    051015
00680   104   213JAPANESE COMPLETELY LIBERALIZE TRADE AND INVESTMENT REST
00685   114   213RICTIONS ON IMPORTS OF GOODS AND CAPITAL.
00690   -2  7777 4     215  1  5     2.000 14    -3.000 1
00700    04   215    PP*    809000    *    153060
00710   104   215JAPAN AND THE EC BECOME INVOLVED IN A TRADE WAR INVOLVIN
00713   114   215G COMPETITIVE DEVALUATIONS OF CURRENCY, TRADE AND INVEST
00716   124   215MENT RESTRICTIONS.
00720   -2  7777 4     216  3  7    -3.000 11    -1.000 1
00730    04   216    PP*    809000    *    154070
00740   104   216JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EMBODYI
00742   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AND TE
00744   124   216CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRAZIL,
00746   134   216 MEXICO AND VENEZUELA.
00750   -2  7777 4     217  1  3    -1.000  3    -1.000 1
00760    04   217    PP*    809000    *    053545
00770   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATION
00870   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PROC
00970   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQU
01070   134   217IPMENT.
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

U.S. Exports to Latin America*

BASELINE

The low R^2 of 0.468 for this baseline is a result of the volatility of U.S. exports, particularly in the 1971-1973 period. These years, which preceded the oil embargo, were characterized by unprecedented GDP growth and import demand in Latin America, and particularly in Brazil. The projection has partially discounted this period as anomolous, and bears much much closer resemblance to the more typical 1960-1970 period. Data from the more volatile period are included here, however, because we believe the most recent behavior of this variable should be taken into account.

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* Data for Latin America consists of aggragated values of Mexico, Brazil, and Venezuela. The data is expressed in 1973 dollars, due to the unavailability of 1974 deflators.

FA1095

00010	1095	1950	1973	1976	2000	1975	11	1.000	[illegible]
00020	0.46842359				-0.00		0.35		
00030	1950		4274.10		3273.51				
00040	1951		4145.90		3373.55				
00050	1952		3605.40		3477.43				
00060	1953		3460.70		3585.32				
00070	1954		3734.80		3697.41				
00080	1955		3405.30		3813.89				
00090	1956		3759.10		3934.96				
00100	1957		3546.20		4060.85				
00110	1958		3671.80		4191.77				
00120	1959		3772.50		4327.96				
00130	1970		4042.30		4469.66				
00140	1971		3951.10		4617.14				
00150	1972		5366.10		4770.75				
00160	1973		5485.10		4930.70				
00170	1976		0.00		5451.41				
00180	1977		0.00		5640.60				
00190	1978		0.00		5837.40				
00200	1979		0.00		6042.78				
00210	1980		0.00		6256.99				
00220	1981		0.00		6480.67				
00230	1982		0.00		6714.25				
00240	1983		0.00		6958.25				
00250	1984		0.00		7213.21				
00260	1985		0.00		7479.71				
00270	1986		0.00		7758.36				
00280	1987		0.00		8049.32				
00290	1988		0.00		8354.77				
00300	1989		0.00		8673.96				
00310	1990		0.00		9008.15				
00320	1991		0.00		9358.18				
00330	1992		0.00		9724.93				
00340	1993		0.00		10109.34				
00350	1994		0.00		10512.39				
00360	1995		0.00		10935.15				
00370	1996		0.00		11378.75				
00380	1997		0.00		11844.39				
00390	1998		0.00		12333.35				
00400	1999		0.00		12847.00				
00410	2000		0.00		13386.79				

Baseline (millions of 1974 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The impact of cartelization on U.S. exports to Latin America is likely to be severe. Although Brazil exports some manganese, none of the Latin American countries under consideration will be beneficiaries overall of cartelization; they are likely, on the contrary, to be hard hit by cartelization of such important minerals as bauxite and tin. The resulting decline in demand for American manufactured products and technology is likely to be immediate and substantial, approaching a negative impact of 8 percent, with a steady state impact being reduced to perhaps 3 percent after nine years. This is a greater negative impact than is the case with Japanese and West European demand for U.S. products, since the Latin Americans are likely to be relatively more seriously affected by restrictions in supply and/or dramatically increased prices for these key minerals.

Event 171. OPEC Dissolves.

Again, this event is likely to have ambiguous impacts at least initially on Latin American demand for U.S. products. Particularly in the case of Venezuela, which is a member of OPEC and a major beneficiary of the cartel, the initial effects are likely to be negative in terms of the level of demand for foreign products. Furthermore, both Brazil and Mexico have certain aspirations for developing their offshore oil facilities and gaining significant revenues from petroleum exports. Therefore, even in the intermediate period, the effect of an OPEC dissolution is not likely to be an unmitigated blessing for any of the three countries involved. However, over the longer period the availability of lower priced petroleum is likely to be beneficial for all the economies, particularly Brazil which is a heavy petroleum importer and has extremely ambitious plans for industrialization in various industries. Therefore, we believe that the long-term effect of an OPEC dissolution on Latin American demand for U.S. exports is likely to be positive approximately 5 percent.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations, and Stable Export Earnings for Producing Nations.

The effect of an agreement with less-developed country raw material exporters to stabilize export prices is likely to stimulate Latin American export income, the general level of economic activity, and therefore its import capacity. The incentive for Latin American raw material exploitation and exporting inherent in an agreement on stable export prices will be particularly important for Brazil, which has vast unexploited natural resources likely to be developed rapidly under the stimulus of guaranteed export earnings. These factors should result in a positive impact of 4 percent.

Event 207. Mexico and Brazil, with Significant Offshore Oil Production, Join OPEC.

The achievement of significant offshore oil production by Mexico and Brazil, and the price stability that their membership in OPEC is likely to provide, should result in a significant increase in demand for imports, as well as import capacity, on the part of both these countries. Particularly in the case of Brazil, which has vast economic potential but is currently a major oil importer, significant development of heavy industry and various manufacturing industries would be a likely result of this event. Since both countries maintain close relationships with the United States, a logical source of the inevitably increased level of imports would be the United States. While the 6 percent maximum impact is certainly a major impact, it is not inconsistent with certain historical periods, for example, the 26.4 percent increase in U.S. exports between 1971 and 1972. A partial leveling off of the positive impact to 4 percent is anticipated, as a result of the inevitable retrenchment that follows or at least has followed in the past, massive OPEC imports of manufactured products from developed countries. This, for example, is the current experience in Iran.

Event 217. Japanese Programs to Stimulate Technological Innovation Achieve Technological Parity or Superiority in Data Processing, Electric Automobiles, and Pollution Abatement Equipment

The achievement of Japanese parity or superiority in these technologies is quite likely to reduce U.S. market shares for similar products in Latin America. The Latin American market is a growing one, increasingly attractive for potential European, Japanese, and American exporters. A displacement of current and potential U.S. exports in data processing, automobiles, and pollution abatement equipment by competitive Japanese products would deprive the U.S. exporters of an important potential market in an economically growing area. That Latin America would surely be an important export target for Japanese firms and the Japanese government is indicated by the current interest being shown, particularly by Japanese data processing and manufacturers and the Ministry of International Trade and Industry in Japan. We have estimated a negative 3 percent impact as a result of these factors.

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00420   -1US EXPORTS TO LATIN AMERICA SCENARIO A
00430   -2  7777 4      51  1  5     -4.000  8     -3.000 1
00440    04    51     PP*     809000     *     257080
00490   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00493   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00496   124    51CHROMIUM.
00500   -2  7777 4      72  5 20     -4.000 20     -4.000 1
00510    04    72     PP*     809000     *     304050
00520   104    72ANTI-EXODUS LAWS ARE PASSED PENALIZING U.S.
00530   114    72INDUSTRY FOR MOVING ITS OPERATION OUTSIDE THE U.S.
00570   -2  7777 4     171  1 14      5.000 14      5.000 1
00580    04   171     PP*     809000     *     051520
00590   104   1710PEC DISSOLVES
00600   -2  7777 4     174  3 12      4.000 12      4.000 1
00610    04   174     PP*     809000     *     151520
00620   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00622   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00624   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00626   134   174CONSUMER NATIONS, AND STABLE EXPORT
00628   144   174EARNINGS FOR PRODUCING NATIONS.
00630   -2  7777 4     195  2  7      8.000 15      8.000 1
00640    04   195     PP*     809000     *     354550
00650   104   195THE CONFERENCE OF INTERNATIONAL ECONOMIC
00651   114   195COOPERATION (CIEC) NEGOTIATES A DEBT AGREE-
00652   124   195MENT ON DEBT RELIEF FOR LDC'S INVOLVING
00653   134   195FORGIVENESS OF EXTERNAL DEBT TO OC GOVERNMENTS
00654   144   195IN EXCHANGE FOR ASSURANCES ON ACCESS TO LDC
00655   154   195RAW MATERIALS.
00660   -2  7777 4     201  3  8     -4.000  8     -4.000 1
00670    04   201     PP*     809000     *     254055
00680   104   201LATIN AMERICAN GOVERNMENTS ADOPT LEGISLATION TO
00681   114   201ACQUIRE MAJORITY OWNERSHIP OF ALL FOREIGN
00682   124   201ENTERPRISES, FOR ALL MULTINATIONAL CORPORATIONS
00683   134   201(MNC'S) TO EXPORT AT LEAST ONE-THIRD OF THEIR
00684   144   201PRODUCTION, TO LIMIT MNC'S REPARTITION OF
00685   154   201CAPITAL, AND TO REQUIRE ALL LOCALLY PRODUCED
00686   164   201GOODS TO CONTAIN 75 PERCENT LOCAL CONTENT.
00690   -2  7777 4     202  4 15      3.000 15      3.000 1
00700    04   202     PP*     809000     *     252525
00710   104   202THE LATIN AMERICAN ECONOMIC SYSTEM (SELA)
00711   114   202ACHIEVES INCREASED REGIONAL ECONOMIC COOPER-
00712   124   202ATION THPOUGHOUT LATIN AMERICA, INCLUDING A
00713   134   202CUSTOMS UNION, COMMON LATIN AMERICAN POSITIONS
00714   144   202ON MNC'S, TARIFF PREFERENCES AND COMMODITY
00715   154   202TRADE, AND SUCCESSFULLY PROMOTES A SPECIFIC
00716   164   202INTERREGIONAL ECONOMIC PROJECTS IN AREAS SUCH
00717   174   202AS ENERGY, RAW MATERIAL DEVELOPMENT, AND
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

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00720   -2  7777 4     203  1 12      1.000 12      1.000 1
00730    04   203     PP*     809000     *      051525
00740   104   203TRANSPORTATION.
00741   104   203/VENEZUELAN PUBLIC INVESTMENTS TOTAL $37 BILLION,
00742   114   203PRINCIPALLY FOR EXPANSION OF STEEL AND ALUMINUM,
00743   124   203MAKING, SHIPBUILDING, HYDROELECTRIC POWER,
00744   134   203PETROLEUM AND PETROCHEMICAL PRODUCTION
00745   144   203CAPACITY.
00750   -2  7777 4     204  1  9      2.000  9      2.000 1
00760    04   204     PP*     809000     *      051525
00770   104   204BRAZIL INVESTS $70 BILLION ON MAJOR DEVELOPMENT
00772   114   204PROJECTS FOR ENERGY, MINERALS, NEW AGRICUL-
00774   124   204TURAL LANDS, STEEL MAKING, HYDROELECTRIC POWER,
00776   134   204AND TRANSPORTATION.
00780   -2  7777 4     205  1  6     14.000 15     11.000 1
00790    04   205     PP*     809000     *      101520
00800   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00803   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00806   124   205GOODS AND CAPITAL.
00810   -2  7777 4     207  2  7      5.000 11      4.000 1
00820    04   207     PP*     809000     *      255075
00830   104   207MEXICO AND BRAZIL, WITH SIGNIFICANT OFF-SHORE
00835   114   207OIL PRODUCTION, JOIN OPEC.
00840   -2  7777 4     215  2  9     -5.000 14     -4.000 1
00850    04   216     PP*     809000     *      154070
00860   104   215JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EMPHASI
00862   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AND TE
00864   124   215CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRAZIL,
00866   134   216 MEXICO AND VENEZUELA.
00870   -2  7777 4     217  1  7     -3.000  7     -3.000 1
00880    04   217     PP*     809000     *      053545
00890   104   217JAPANESE PROGRAMS TO STIMULATE TECHNOLOGICAL INNOVATION
00990   114   217ACHIEVE TECHNOLOGICAL PARITY OR SUPERIORITY IN DATA PROC
01090   124   217ESSING, ELECTRIC AUTOMOBILES AND POLLUTION ABATEMENT EQU
01190   134   217IPMENT.
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TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

U.S. Imports from Latin America

BASELINE

The baseline projection provides a relatively close fit ($R^2 = 0.744$) to the historical data, with a major departure in 1973, which was a year of unusually high U.S. import demand for Latin American products. The baseline projection has partially discounted the 1973 data and taken the 1967-1972 experience as more typical of the behavior of this variable. The 1973 data were included because we believe the most recent behavior of this variable should be taken into account. The baseline depicts gradual increases in U.S. imports with diminishing growth rates.

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FA1098
00010      1098   1967   1973   1976   2000   1975      14      1.000   10000.000
00020     0.74403167                          0.06            -4.08
00030     1967        3388.40          3006.86
00040     1968        3546.70          3282.16
00050     1969        3386.50          3569.81
00060     1970        3597.10          3868.15
00070     1971        3758.20          4175.24
00080     1972        4212.30          4488.85
00090     1973        5282.20          4806.59
00100     1975           0.00          5758.87
00110     1977           0.00          6067.53
00120     1978           0.00          6367.89
00130     1979           0.00          6657.95
00140     1980           0.00          6935.99
00150     1981           0.00          7200.62
00160     1982           0.00          7450.80
00170     1983           0.00          7685.80
00180     1984           0.00          7905.24
00190     1985           0.00          8108.98
00200     1986           0.00          8297.18
00210     1987           0.00          8470.18
00220     1988           0.00          8628.51
00230     1989           0.00          8772.92
00240     1990           0.00          8903.88
00250     1991           0.00          9022.51
00260     1992           0.00          9129.55

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00270     1993           0.00          9225.87
00280     1994           0.00          9312.34
00290     1995           0.00          9389.79
00300     1996           0.00          9459.02
00310     1997           0.00          9520.80
00320     1998           0.00          9575.84
00330     1999           0.00          9624.81
00340     2000           0.00          9668.32
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<u>Baseline (millions of 1973 dollars)</u>

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The development of cartels for these particular minerals is not apt to benefit these particular Latin American countries, since none are major producers or exporters of bauxite, manganese, tin, and chromium. At the same time, the initial effects of cartelization in these areas is bound to reduce the level of economic activity in the United States, and therefore reduce the demand for Latin American raw materials--Venezuelan petroleum, Brazilian iron ore--as well as Mexican and Brazilian manufactured products. Not only will demand for these products decline, but investment funds will be directed by government into new substitutes, which should also reduce the level of demand for imports. The impact should be 6 percent. This effect will diminish to 3 percent, as substitutes are developed, or lower grade raw materials become economically competitive given the cartel induced higher prices.

Event 171. OPEC Dissolves

This event has a series of contradictory impacts on U.S. imports from Latin America. The initial effect, particularly on imports from Venezuela, will be negative. Venezuelan revenues from petroleum exports to the United States will fall precipitously, as will near term future Mexican and Brazilian exports of petroleum. However, the longer term effects of this event are likely to be positive. There are a number of reasons for this, including the general benefits to be derived by the Mexican and Brazilian economies from a decrease in petroleum prices; development of new manufacturing industries, as well as the improvement of existing industries, as a result of the availability of lower priced oil; the increase in U.S. demand for imported products as a result of dissolution of the cartel; and the generally improved nature of economic relationships between the various governments involved. Thus we calculate a long term positive benefit of 7 percent in this case.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements with LDC/s, Assuring Access to Raw Material Supplies for Consumer Nations, and Stable Export Earnings for Producing Nations.

Commodity agreements between the developing countries and developed countries are apt to be of major benefit to Latin American exporters, particularly exporters of raw materials. Such countries as Brazil and Venezuela, which are major exporters currently of raw materials, and Mexico, which is a potential exporter, will benefit from the commitment from developed importing countries to provide stable prices, and therefore stable export earnings for less-developed country exporters. The countervailing trend, which will tend to keep the positive impact to approximately 3 percent, will be the possible consequences in terms of increased inflation in the developed countries, and the possible suppression of demand for imported raw materials.

Event 208. Venezuela Withdraws From OPEC.

There are certain contradictory elements inherent in this event. On the one hand, to the extent that it implies a dissolution of OPEC, the impact is likely to be ultimately negative with respect to Venezuelan exports to the United States, and its future level of economic development. On the other hand, the other Latin American economies involved, in this case Mexico and Brazil, are likely to benefit from lower petroleum costs, and therefore to enhance the competitiveness of their export base to the United States, particularly in heavy industries such as steel, and in the manufacture of certain consumer items. Therefore, the longer term negative effect is likely to be less severe than the shorter term negative 3 percent impact on U.S. imports from Latin America, which is largely a function of declining petroleum export revenues from Venezuela.

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00350   -19US IMPORTS FROM LATIN AMERICA SCENARIO A
00360   -2  7777 4     51  1  3    -6.000  9    -3.000 1
00370    04    51    PP*    809000     *     257090
00380   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00396   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00412   124    51CHROMIUM.
00430   -2  7777 4     171  1 14     7.000 14     7.000 1
00440    04   171    PP*    809000     *     051520
00450   104   171OPEC DISSOLVES
00460   -2  7777 4     174  2  5     3.000  8     2.000 1
00470    04   174    PP*    809000     *     151520
00480   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00482   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00484   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00486   134   174CONSUMER NATIONS, AND STABLE EXPORT
00488   144   174EARNINGS FOR PRODUCING NATIONS.
00490   -2  7777 4     200  1  5     2.000 16    -2.000 1
00500    04   200    PP*    809000     *     101520
00510   104   200GATT NEGOTIATIONS RESULT IN A SYSTEM OF DC
00512   114   200PREFERENCES FOR LDC EXPORTS, AND A NEW GATT
00514   124   200ORGANIZATION GOVERNING DC-LDC TRADE, WHICH LINKS
00516   134   200LEVEL OF TARIFF PREFERENCES TO LEVEL OF LDC
00518   144   200DEVELOPMENT.
00520   -2  7777 4     201  1  4     2.000 11    -2.000 1
00530    04   201    PP*    809000     *     254055
00540   104   201LATIN AMERICAN GOVERNMENTS ADOPT LEGISLATION TO
00541   114   201ACQUIRE MAJORITY OWNERSHIP OF ALL FOREIGN
00542   124   201ENTERPRISES, FOR ALL MULTINATIONAL CORPORATIONS
00543   134   201(MNC'S) TO EXPORT AT LEAST ONE-THIRD OF THEIR
00544   144   201PRODUCTION, TO LIMIT MNC'S REPARTITION OF
00545   154   201CAPITAL, AND TO REQUIRE ALL LOCALLY PRODUCED
00546   164   201GOODS TO CONTAIN 75 PERCENT LOCAL CONTENT.
00550   -2  7777 4     202  3  9     5.000  9     5.000 1
00560    04   202    PP*    809000     *     252525
00570   104   202THE LATIN AMERICAN ECONOMIC SYSTEM (SELA)
00571   114   202ACHIEVES INCREASED REGIONAL ECONOMIC COOPER-
00572   124   202ATION THROUGHOUT LATIN AMERICA, INCLUDING A
00573   134   202CUSTOMS UNION, COMMON LATIN AMERICAN POSITIONS
00574   144   202ON MNC'S, TARIFF PREFERENCES AND COMMODITY
00575   154   202TRADE, AND SUCCESSFULLY PROMOTES A SPECIFIC
00576   164   202INTERREGIONAL ECONOMIC PROJECTS IN AREAS SUCH
00577   174   202AS ENERGY, RAW MATERIAL DEVELOPMENT, AND
00578   184   202TRANSPORTATION.
00580   -2  7777 4     203  6 14     4.000 14     4.000 1
00590    04   203    PP*    809000     *     051525
00600   104   203VENEZUELEAN PUBLIC INVESTMENTS TOTAL $37 BILLION,
00602   114   203PRINCIPALLY FOR EXPANSION OF STEEL AND ALUMINUM,
00604   124   203MAKING, SHIPBUILDING, HYDROELECTRIC POWER,
00606   134   203PETROLEUM AND PETROCHEMICAL PRODUCTION
00608   144   203CAPACITY.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

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00610   -2  7777 4    204  6 14     4.000 14     4.000 1
00620    04   204    PP*    809000     *     051525
00630   104   204BRAZIL INVESTS $70 BILLION ON MAJOR DEVELOPMENT
00632   114   204PROJECTS FOR ENERGY, MINERALS, NEW AGRICUL-
00634   124   204TURAL LANDS, STEEL MAKING, HYDROELECTRIC POWER,
00636   134   204AND TRANSPORTATION.
00640   -2  7777 4    208  1  5    -3.000  9    -1.000 1
00650    04   208    PP*    809000     *     051015
00660   104   208VENEZUELA WITHDRAWS FROM OPEC.
00670   -2  7777 4    216  1  4    -5.000  4    -5.000 1
00680    04   216    PP*    809000     *     154070
00690   104   216JAPAN ENTERS INTO PREFERENTIAL TRADE AGREEMENTS, EMB(
00790   114   216NG PREFERRED ACCESS TO MARKETS AND RAW MATERIALS, AN(
00890   124   216CHNOLOGY TRANSFER, WITH CERTAIN LDC'S, INCLUDING BRA(
00990   134   216 MEXICO AND VENEZUELA.
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TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

U.S. Investments in Latin America

BASELINE

The baseline represents an excellent fit (R^2 = 0.9397) to the historical data for the 1967-1973 period. Data prior to 1967 was highly irregular, well below the values for the period shown and was therefore excluded from the baseline calculation. The baseline projection depicts significant increases in U.S. investments and excalating growth rates (from 2.0 percent between 1977-1978 to 3.5 percent between 1997 and 1998). This is compatible with our expectations for rising GNP growth and capital demand in Latin America.

FA1096

00010	1096	1967	1973	1976	2000	1976	5	2.000	100000.000
00020	0.93974283					-0.00	0.00		
00030	1967		6551.20		6528.95				
00040	1968		6575.60		6641.67				
00050	1969		6851.50		6755.33				
00060	1970		6913.00		6879.17				
00070	1971		6899.90		7004.41				
00080	1972		7108.90		7134.30				
00090	1973		7315.00		7269.09				
00100	1976		0.00		77[illegible]5.97				
00110	1977		0.00		7863.36				
00120	1978		0.00		8027.43				
00130	1979		0.00		8193.49				
00140	1980		0.00		8377.00				
00150	1981		0.00		8563.45				
00160	1982		0.00		8758.40				
00170	1983		0.00		8962.43				
00180	1984		0.00		9176.18				
00190	1985		0.00		9400.39				
00200	1986		0.00		9635.82				
00210	1987		0.00		9883.35				
00220	1988		0.00		10143.94				
00230	1989		0.00		10413.64				
00240	1990		0.00		10708.62				
00250	1991		0.00		11015.22				
00260	1992		0.00		11339.88				
00270	1993		0.00		11684.27				
00280	1994		0.00		12050.23				
00290	1995		0.00		12439.86				
00300	1996		0.00		12855.52				
00310	1997		0.00		13293.92				
00320	1998		0.00		13776.15				
00330	1999		0.00		14287.74				
00340	2000		0.00		14836.80				

Baseline (millions of 1973 dollars)

(See p. 2.4 for key
to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The impact of this event is ambiguous. On the one hand, the formation of cartels in these particular minerals is likely to lower the general level of economic activity in the United States, decrease the availability of investment capital, and induce the government to attempt to direct investment funds towards certain domestic substitutes or lower grade ores which might ultimately provide the United States with a greater degree of self sufficiency. In addition, the general economic climate between the United States and less developed countries, including those of Latin America, is apt to erode considerably. This accounts for the negative impact. On the other hand, important investment opportunities will be created by virtue of the formation of cartels, and these opportunities are likely to be particularly attractive in such countries such as Brazil, which has a stable government, has traditionally been receptive to foreign investment, and has enormous unexploited natural resources. Therefore, the initial negative impact of 2 percent is relatively modest, and the ultimate impact should be zero.

Event 171. OPEC Dissolves.

This event is likely to have an immediate and extremely beneficial impact on U.S. investments in Latin America. The only exception, of course, is the impact of U.S. investments in Venezuela, which by virtue of the disadvantages to Venezuela inherent in a dissolution of OPEC, are apt to diminish somewhat. However, Venezuela has not been an important area of U.S. investment in Latin America, when compared with Brazil and Mexico. The impact of an OPEC dissolution on these two latter countries is likely to be extremely positive, since both have suffered from high petroleum import requirements, and both have substantial potential for industrial development given access to less expensive energy sources. Therefore, the levels of economic growth likely to be sustainable by Brazil and Mexico under conditons of a free market for petroleum should be high enough to attract substantial investment capital from the United States. Added to this is the likelihood of improved investment climates in these countries, as well as a general improvement of U.S.-Latin American diplomatic relationships as a result of the dissolution of the oil cartel.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

The shutting off of investment opportunities to U.S. capital in the European Community and Japan is likely to have an initial effect of redirecting funds towards opportunities for investment in Latin America. Investment funds are in fact rather volatile at times, and do respond to such government policies by seeking other investment outlets; this is demonstrated by the current trend among certain investors in Latin America to begin reorienting their investment policies toward developed countries as a result of recent

trends toward expropriation and forced modification of agreements in the LDC's. On the other hand, the long-term effect is not likely to be substantial as the maximum impact, since the effect of European and Japanese protectionism is likely to be a general decline in global growth, which is apt to diminish the investment opportunities for any foreign investor. These factors should produce a maximum of 2 percent impact.

Event 206. Escalating Guerrilla Warfare and Radicalization in Latin American Governments Leads to Expropriation of Foreign Assests and Renunciation of Debts to Developed Countries.

This event would have an immediate and profoundly negative impact on U.S. investments in Latin America. There are several obvious reasons for this, including the likely dramatic increase in the incidence of expropriations, forced modification of agreements, constant government and domestic interest group intrusion in the production process, increased labor activity and unrest, increased insecurity for the United States and other foreign executives in Latin America, as well as a deterioration in investment relations between Latin American governments and the U.S. government. In effect, the entire spectrum of political, social, and economic incentives to investment would be reduced, and in their place would develop an extremely uncertain and unfavorable climate for new investment, as well as the retention of existing investment in Latin America. These for us should produce a dramatic negative impact of 12 percent which is likely to persist through the year 2000.

Event 207. Mexico and Brazil, with Significant Offshore Oil Production, Join OPEC.

The achievement of significant petroleum production, and membership in the OPEC cartel of Mexico and Brazil, will significantly enhance the investment requirements, and therefore the capital incentives, provided by these two countries. As we have seen in the case of exisiting OPEC members, the effect of increased petroleum revenues, particularly for those countries with significant development requirements--which would include both Mexico and Brazil--is a rapid and significant increase in the level of foreign investment in industries which are targeted by national plans for significant development. This will probably include, in the case of both these countries, increased opportunities in the other raw material extractive industries, as well as in refining raw materials and manufacturing. The increase in investment of approximately 5 percent assumes that the general investment climate remains favorable.

```
00350   -19US INVESTMENTS IN LATIN AMERICA SCENARIO A
00360   -2  7777 4      51  1  3     -2.000  8      0.000 1
00370    04    51     PP*     809000     *     257090
00380   104     51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00396   114     51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00412   124     51CHROMIUM.
00430   -2  7777 4      72  1  5     -8.000 12     -5.000 1
00440    04    72     PP*     809000     *     304050
00450   104     72ANTI-EXODUS LAWS ARE PASSED PENALIZING U.S.
00460   114     72INDUSTRY FOR MOVING ITS OPERATION OUTSIDE THE U.S.
00500   -2  7777 4     171  1  4      5.000  4      8.000 1
00510    04   171     PP*     809000     *     051520
00520   104   171OPEC DISSOLVES
00530   -2  7777 4     172  3  6      2.000 10      1.000 1
00540    04   172     PP*     809000     *     102030
PAGE 1-53                          FACOMB      TUE 28-DEC-75 5:41

00550   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00553   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
00556   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
00560   -2  7777 4     201  1  7     -6.000 12     -5.000 1
00570    04   201     PP*     809000     *     254055
00580   104   201LATIN AMERICAN GOVERNMENTS ADOPT LEGISLATION TO
00581   114   201ACQUIRE MAJORITY OWNERSHIP OF ALL FOREIGN
00582   124   201ENTERPRISES, FOR ALL MULTINATIONAL CORPORATIONS
00583   134   201(MNC'S) TO EXPORT AT LEAST ONE-THIRD OF THEIR
00584   144   201PRODUCTION, TO LIMIT MNC'S REPARTITION OF
00585   154   201CAPITAL, AND TO REQUIRE ALL LOCALLY PRODUCED
00586   164   201GOODS TO CONTAIN 75 PERCENT LOCAL CONTENT.
00590   -2  7777 4     202  3  8      7.000  8      7.000 1
00600    04   202     PP*     809000     *     252525
00610   104   202THE LATIN AMERICAN ECONOMIC SYSTEM (SELA)
00611   114   202ACHIEVES INCREASED REGIONAL ECONOMIC COOPER-
00612   124   202ATION THROUGHOUT LATIN AMERICA, INCLUDING A
00613   134   202CUSTOMS UNION, COMMON LATIN AMERICAN POSITIONS
00614   144   202ON MNC'S, TARIFF PREFERENCES AND COMMODITY
00615   154   202TRADE, AND SUCCESSFULLY PROMOTES A SPECIFIC
00616   164   202INTERREGIONAL ECONOMIC PROJECTS IN AREAS SUCH
00617   174   202AS ENERGY, RAW MATERIAL DEVELOPMENT, AND
00618   184   202TRANSPORTATION.
```


TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

```
00620   -2  7777 4     203  2  9      2.000 13      1.000 1
00630    04   203     PP*     809000     *     051525
00640   104   203VENEZUELEAN PUBLIC INVESTMENTS TOTAL $37 BILLION,
00642   114   203PRINCIPALLY FOR EXPANSION OF STEEL AND ALUMINUM,
00644   124   203MAKING, SHIPBUILDING, HYDROELECTRIC POWER,
00646   134   203PETROLEUM AND PETROCHEMICAL PRODUCTION
00648   144   203CAPACITY.
00650   -2  7777 4     204  2  7      3.000 14      2.000 1
00660    04   204     PP*     809000     *     051525
00670   104   204BRAZIL INVESTS $70 BILLION ON MAJOR DEVELOPMENT
00672   114   204PROJECTS FOR ENERGY, MINERALS, NEW AGRICUL-
00674   124   204TURAL LANDS, STEEL MAKING, HYDROELECTRIC POWER,
00676   134   204AND TRANSPORTATION.
00680   -2  7777 4     205  1 12      9.000 17      6.000 1
00690    04   205     PP*     809000     *     101520
00700   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00703   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00706   124   205GOODS AND CAPITAL.
00710   -2  7777 4     206  1  5    -12.000  5    -12.000 1
00720    04   206     PP*     809000     *     203555
00730   104   206ESCALATING GUERRILLA WARFARE AND A RADICALIZATION
00732   114   2060F LATIN AMERICAN GOVERNMENTS LEADS TO A EXPRO-
00734   124   206PRIATION OF FOREIGN ASSESTS AND RENUNCIATION OF
00736   134   2060EBTS TO DEVELOPED COUNTRIES.
00740   -2  7777 4     207  2  9      5.000 13      3.000 1
00750    04   207     PP*     809000     *     255075
00760   104   207MEXICO AND BRAZIL, WITH SIGNIFICANT OFF-SHORE
00660   114   2070IL PRODUCTION, JOIN OPEC.
```

TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

Latin American Debt to the United States

BASELINE

The baseline provides an excellent fit (R^2 = 0.9188) to the historical data. Unfortunately, data prior to 1971 is not available. The projection depicts gradual increases in the level of Latin American debt to the United States, with the rate of increase declining from 3.56 percent between 1976 and 1977, to 1.48 percent between 1996 and 1997. This decline is plausible, considering the probability of increased GDP growth and export revenues among these countries which should permit debt repayment and expanded internal financing for future growth.

```
.TYPE FA1097
00010       1097   1971   1973   1976   2000   1976      07       0.000  20
**000.000
00020     0.91876284                                0.05      -4.28
00070     1971          4323.00        4379.093
00080     1972          4738.00        4624.24
00090     1973          4805.00        4862.67
00100     1976             0.00        5540.32
00110     1977             0.00        5754.47
00120     1978             0.00        5963.13
00130     1979             0.00        6166.50
00140     1980             0.00        6364.79
00150     1981             0.00        6558.19
00160     1982             0.00        6746.86
00170     1983             0.00        6931.00
00180     1984             0.00        7110.74
00190     1985             0.00        7286.26
00200     1986             0.00        7457.70
00210     1987             0.00        7625.19
00220     1988             0.00        7788.88
00230     1989             0.00        7948.89
00240     1990             0.00        8105.35
00250     1991             0.00        8258.36
00260     1992             0.00        8408.05
00270     1993             0.00        8554.52
00280     1994             0.00        8697.87
00290     1995             0.00        8838.21
00300     1996             0.00        8975.62
00310     1997             0.00        9110.20
00320     1998             0.00        9242.03
00330     1999             0.00        9371.20
00340     2000             0.00        9497.79
```


Baseline (millions of 1973 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Note: This variable was suggested by the FAA staff as a replacement for Latin American investment in the United States because of the lack of data on Brazilian, Mexican, and Venezuelan investment in the United States. The external debt data, while an improvement on the data available for investment, is not complete. Data points on Brazilian, Mexican, and Venezuelan public debt to U.S. public and private institutions exists for the years 1971 1972, and 1973. However, data on public indebtedness is a good measure of total (public and private) indebtedness for only Mexico and Venezuela, since a substantial portion of Brazilian debt is owned by private Brazilian institutions, and this data is unavailable. However, when aggregated, we believe that the total public indebtedness of these countries remains a useful indicator of U.S.-Latin American economic relations.

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The cartelization of these minerals is likely to reduce growth rates of these particular countries, and therefore the availability of capital for further development. The only exception to this case is Brazil, which might benefit modestly from cartel-induced price increases for manganese. However, with respect to the other two countries, and concerning the results of cartelization of the other three minerals for Brazil, the impact will certainly be injurious. Assuming that their development plans continued to be as ambitious as they are currently, the requirement for imported capital will increase significantly. This will at least be true in the interim period, while alternate mineral sources come onstream, which ultimately will benefit these various Latin American countries, and tend to diminish the need for external capital for financing development. We have estimated a positive impact of 4 percent on Latin American indebtedness to the United States as a result of this event. While 4 percent is substantial, it is well below the recent increases in, for example, Mexican public indebtedness to U.S. financial institutions. As we noted, the impact on Brazil will be somewhat less severe as a result of benefits accruing to Brazil from increases in manganese prices. We also assume here that the Venezuelans will not suffer grievously, since substantial revenues accruing from the export of petroleum should compensate for other resource cartels and permit the Venezuelans to internally finance its development plans.

Event 171. OPEC Dissolves.

Dissolution of OPEC, the dramatic price decreases for petroleum and the resulting sharp decrease in the import costs of petroleum for the various countries involved, should generally benefit Latin American economic growth. Of course the major exception is Venezuela which, in the short term at least, will be forced either to curtail somewhat its internal development plans, or increase external borrowing to finance existing development plans. This impact, which is likely to increase Venezuelan indebtedness, is more than counter-balanced by the benefits accruing to Mexico and Brazil, both of which are heavily in debt to the United States and both of which will, by virtue

of increased economic growth, be able to repay existing debts to a certain extent, as well as to increase internal financing of future development plans. Such an event is likely also to substantially increase export revenue accruing to both Mexico and Brazil through the export of certain raw materials and manufactured products, which revenue can, of course, then be applied to financing of internal development. Therefore, we would again estimate roughly a negative impact on total indebtedness to the United States of 5 percent, with a slight leveling off to 3 percent after 12 years.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreement with LDC's, Assuring Access to Raw Material Supplies for Consumer Nations, and Stable Export Earnings for Producing Nations.

Commodity agreements which guarantee stable export prices for Latin American raw material exports are bound to benefit the general level of Latin American economic growth through increased export revenues, and will therefore enable Latin American countries to finance a relatively greater proportion of their own internal development requirements. This is particularly the case for Brazil, which will benefit by higher prices for such important export commodities as manganese and iron ore; and Mexico, which is an important exporter of gypsum, lead, sulphur, and zinc. There we calculate a maximum impact in indebtedness of 4 percent.

Event 206. Escalating Guerrilla Warfare and Radicalization in Latin American Governments Leads to Expropriation of Foreign Assets and Renunciation of Debts to Developed Countries.

The effect of a radicalization of Latin American politics is likely to be a re-orientation in external loan policy toward the Soviet bloc and certain neutralist governments. This is likely to be accompanied by the renunciation of certain debts, as well as by a general retrenchment in economic exchanges between these particular Latin American countries and the United States. The maximum effect of these political and economic changes is likely to be decline in indebtedness to U.S. public and private financial institutions of approximately 6 percent. This assumes that not all indebtednesses is abrogated, and that there is not a complete rupture in exchanges of capital between the United States and these particular countries. We believe there will be a decline in the impact of this event as capital requirements within these countries continue to increase, and the basic limitations on available capital among various centrally planned economies begins to force a return to developed, market economy capital markets for funds to finance internal development requirements.

Event 207. Mexico and Brazil, with Significant Offshore Production, Join OPEC.

The development of significant offshore oil production and consequent membership in OPEC of Mexico and Brazil is likely to substantially increase the export revenues through shipments of crude oil. It is also likely to enable both countries to substitute these new petroleum resources for present imports of crude oil from existing OPEC countries. The combined effect of import substitution and increased export revenues will be the increased

availability of capital both for repaying existing debts and for financing new development through internal resources. This should result in a negative effect on indebtedness of approximately 4 percent. This impact is likely to stabilize at negative 2 percent as a result of increased development requirements that historically have been associated with increased export capacities of existing OPEC countries. As development plans become more ambitious, there is likely to be a renewed requirement for a certain amount of capital from developed countries.

```
00350   -19LATIN AMERICAN DEBT TO US  SCENERIO  A
00360   -2  7777 4     51  3  7     4.000 11     3.000 1
00370    04    51    PP*    809000    *    257090
00380   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00395   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00412   124    51CHROMIUM.
00430   -2  7777 4    171  2  8    -5.000 12    -3.000 1
00440    04   171    PP*    809000    *    051520
00450   104   171OPEC DISSOLVES
00460   -2  7777 4    174  3 10    -4.000 10    -4.000 1
00470    04   174    PP*    809000    *    151520
00480   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00482   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00484   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00486   134   174CONSUMER NATIONS, AND STABLE EXPORT
00488   144   174EARNINGS FOR PRODUCING NATIONS.
00490   -2  7777 4    199  1  1   -25.000 20   -15.000 1
00500    04   199    PP*    809000    *    354560
00510   104   199THE CONFERENCE OF INTERNATIONAL ECONOMIC
00511   114   199COOPERATION (CIEC) NEGOTIATES A BROAD AGREE-
00512   124   199MENT ON DEBT RELIEF FOR LDC'S INVOLVING
00513   134   199FORGIVENESS OF EXTERNAL DEBT TO DC GOVERNMENTS
00514   144   199IN EXCHANGE FOR ASSURANCES ON ACCESS TO LDC
00515   154   199RAW MATERIALS.
00520   -2  7777 4    200  4  9    -8.000 17    -5.000 1
00530    04   200    PP*    809000    *    101520
00540   104   200GATT NEGOTIATIONS RESULT IN A SYSTEM OF DC
00542   114   200PREFERENCES FOR LDC EXPORTS, AND A NEW GATT
00544   124   200ORGANIZATION GOVERNING DC-LDC TRADE, WHICH LINKS
00546   134   200LEVEL OF TARIFF PREFERENCES TO LEVEL OF LDC
00548   144   200DEVELOPMENT.
00550   -2  7777 4    203  3  6     2.000 14    -2.000 1
00560    04   203    PP*    809000    *    051525
00570   104   203VENEZUELEAN PUBLIC INVESTMENTS TOTAL $37 BILLION,
00572   114   203PRINCIPALLY FOR EXPANSION OF STEEL AND ALUMINUM,
00574   124   203MAKING, SHIPBUILDING, HYDROELECTRIC POWER,
00576   134   203PETROLEUM AND PETROCHEMICAL PRODUCTION
00578   144   203CAPACITY.
00580   -2  7777 4    204  3  6     3.000 14    -2.000 1
00590    04   204    PP*    809000    *    051525
00600   104   204BRAZIL INVESTS $70 BILLION ON MAJOR DEVELOPMENT
00602   114   204PROJECTS FOR ENERGY, MINERALS, NEW AGRICUL-
00604   124   204TURAL LANDS, STEEL MAKING, HYDROELECTRIC POWER,
00606   134   204AND TRANSPORTATION.
00610   -2  7777 4    205  1  8     3.000 13     2.000 1
00620    04   205    PP*    809000    *    101520
00630   104   205LATIN AMERICAN GOVERNMENTS COMPLETELY LIBERALIZE
00633   114   205THEIR TRADE AND INVESTMENT CONTROLS OVER IMPORTS OF
00636   124   205GOODS AND CAPITAL.
00640   -2  7777 4    206  1  1    -6.000  8    -2.000 1
00650    04   206    PP*    809000    *    203555
00660   104   206ESCALATING GUERRILLA WARFARE AND A RADICALIZATION
00662   114   206OF LATIN AMERICAN GOVERNMENTS LEADS TO A EXPRO-
00664   124   206PRIATION OF FOREIGN ASSETS AND RENUNCIATION OF
00666   134   206DEBTS TO DEVELOPED COUNTRIES.
00670   -2  7777 4    207  2  5    -4.000 10    -2.000 1
00680    04   207    PP*    809000    *    255075
00690   104   207MEXICO AND BRAZIL, WITH SIGNIFICANT OFF-SHORE
00790   114   207OIL PRODUCTION, JOIN OPEC.
*E
```

TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

Price of OPEC Crude Oil

BASELINE

The fit program was useless for projecting this variable because of the basic discontinuity in OPEC prices which occurred in 1973-1974. Thus, growth rates for real (constant 1975 dollars) price increases were assigned, based upon the likelihood of modest, and declining, growth in the real costs of OPEC petroleum. These annual growth rates are 2 percent through 1984, 1.5 percent through 1991, and 1.0 percent through 2000. The assumptions implicit in these rates are (1) OPEC will maintain adequate leverage to increase prices, beyond the general level of inflation, by the specified growth rates; (2) the ability of OPEC to overcompensate for inflation will diminish toward the year 2000 as alternate energy sources are developed in petroleum importing countries.

```
 TYPE FA3099
00010      1099   1974   1975   1976   2000 : 1976      14       0.000
++ 22.000
00020     1.00000000                              0.06          -4.20
00040     1975          12.22          12.22
00050     1976           0.00          12.46
00060     1977           0.00          12.71
00070     1978           0.00          12.97
00080     1979           0.00          13.23
00090     1980           0.00          13.49
00100     1981           0.00          13.76
00110     1982           0.00          14.04
00120     1983           0.00          14.32
00130     1984           0.00          14.60
00140     1985           0.00          14.82
00150     1986           0.00          15.05
00160     1987           0.00          15.27
00170     1988           0.00          15.50
00180     1989           0.00          15.73
00190     1990           0.00          15.97
00200     1991           0.00          16.21
00210     1992           0.00          16.37
00220     1993           0.00          16.53
00230     1994           0.00          16.70
00240     1995           0.00          16.87
00250     1996           0.00          17.03
00260     1997           0.00          17.21
00270     1998           0.00          17.38
00280     1999           0.00          17.55
00290     2000           0.00          17.73
```

Baseline (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 51. Developing Countries Form Cartels for Key Raw Materials: Bauxite, Manganese, Tin, and Chromium.

The effect of resource cartels in these particular minerals is likely to increase the import cost of certain minerals to OPEC members though certainly only to moderate proportions. OPEC is also an importer of manufactured products the price of which will increase as a result of cartelization. It is likely that OPEC will use such an event as justification to jack up the price of crude oil and that such an increase will more than compensate for the general increase in prices of imported products and raw materials which result from the resource cartels. We believe that the price increase in OPEC crude oil above the level of inflation attributable specifically to cartelization will be rather modest, approximately 2 percent positive.

Event 171. OPEC Dissolves.

Estimating the impact of dissolution of OPEC on the long-term price of OPEC crude oil requires a number of assumptions, and cannot reflect particularly rigorous calculations. In assessing the initial impact of the event upon the price of crude oil, the assumption is that the events which lead to OPEC dissolution create such dissension within OPEC that the degree of cooperation among the former cartel members is minimal. Based upon this assumption, we would calculate an initial return of Saudi-Arabian crude oil prices to their levels prior to the embarge of 1974, which at approximately $5.40 per barrel represents a decline in the price of crude oil of 60 percent. Although even a price at this level is far above the actual production costs in the Middle East, it is also assumed that the price of OPEC oil will not return to its pre-OPEC levels, that is to the levels which prevailed prior to 1971 when OPEC began effectively to administer prices. At the level of approximately $5.40 per barrel, the immediate effect would be to render uneconomic various alternate energy sources which are being explored by the various petroleum consumer countries, including, for example, North Sea oil, Alaskan oil, and off-shore reserves. They would certainly end any serious consideration to exploitation of such sources as geothermal, shale or tar sands. As the prices of these alternate sources are undercut and users respond to the dramatic decline in energy prices, there would be a rapid increase in demand for OPEC petroleum, which combined with the relative unavailability of alternate sources, would lead to a gradual, longer term increase in the price of Saudi-Arabian crude oil. It is assumed here that the price of Saudi-Arabian crude oil will rise to approximately the level at which alternate sources, for example Alaskan oil, become economic. That price has been calculated at approximately $9 a barrel, which would represent a decline in the original price of OPEC crude, as of August 1976, of approximately 30 percent. It is also assumed here that the $9 barrel price of Saudi-Arabian crude oil will not be exceeded, since Western and other consumer countries will make efforts to avoid a continued escalation in Middle Eastern crude oil prices through determined efforts to bring alternate sources onstream. In sum, we should see a dramatic and immediate fall

in crude prices toward their preembargo levels, followed by a rapid increase in demand for Middle Eastern oil and a resulting increase in the price of that oil to levels at which alternate sources again become economically feasible. This would be followed by a levelling off of world petroleum prices at approximately $9 a barrel, which represents a total decrease in OPEC crude oil prices of approximately 30 percent.

Event 174. United States and Other Developed Countries Negotiate Multilateral Agreements With LDC's, Assuring Access to Raw Material Supplies for Consumer Nations, and Stable Export Earnings for Producer Nations.

This event is likely to have somewhat contradictory impacts on the price of OPEC crude oil. On the other hand, the satisfaction of this traditional LDC--OPEC supported--demand by developed countries is likely to improve the diplomatic climate between petroleum producers and consumers. On the other hand, the stabilization of export prices for key raw materials is likely to lead to a gradual and long term escalation in the price of these raw material exports, for which OPEC would probably overcompensate by increases in the price of crude oil. The resulting impact should be +2 percent.

Event 197. Development of North Sea Oil and Natural Gas, and Further Growth in Nuclear Power in France, The United Kingdom, Italy, and West Germany Enable Europe to Supply 65 Percent of Its Energy Needs.

Again there is no sure way of calculating the impact of increased European self-sufficiency on OPEC crude oil. We can say that the impact of declining European requirements for OPEC crude will increase price pressure on the cartel, and will result in a decline in OPEC crude oil prices offered on world markets. OPEC currently supplies approximately 55 percent of European energy requirements. Under the conditions established in the event, OPEC supplies as a percentage of European consumption should decline to approximately 35 percent. This assumes minimal imports from non-OPEC sources, such as the Soviet Union. Since the European Community took about 50 percent of total OPEC exports in 1975, the consequences of a drop in European consumption of OPEC oil to 35 percent of its total energy consumption will result in a decline in the total percentage of OPEC exports taken by the European Community to 30 percent. This is a significant decline in OPEC export markets, which will partially be compensated for by increased consumption in less-developed countries, as well as continued demand increases in other developed countries, particularly Japan and the United States. Although certainly such an event is hardly adequate to stimulate the dissolution of the cartel, the price pressure is incontrovertible, and we would estimate an approximate negative 5 percent impact on OPEC prices as a result.

Event 208. Venezuela Withdraws from OPEC.

Again, the impact on this event cannot be calculated by any rigorous methodology. We can estimate, however, that the impact of Venezuelan withdrawal from OPEC, assuming that the cartel as a whole remains cohesive, will not be substantial. A recent article in Foreign Policy by Theodore H. Moran projected total OPEC export capacity in 1980 at 49.2 million barrels per day. The forecast for Venezuelan export capacity in 1980

with 3 billion barrels per day. Assuming these figures to be realistic, future Venezuelan export capacity will amount to only 6 percent of total OPEC export capacity. Even assuming that a Venezuelan withdrawal from OPEC is followed by price cuts in Venezuelan crude oil to, let us say, $5.50 per barrel, the impact upon the price structure of OPEC oil as a whole is apt to be minimal, we estimate 2 percent.

Event 220. OPEC Countries Continue to Spend Large Portions of Revenue on Imports of Products and Technology.

Continued sizeable OPEC purchases of manufactured products in the major petroleum consuming countries is a strong incentive to continued OPEC price increases. First of all, those purchases sustain the level of economic activity in consumer nations, and therefore their demand for OPEC petroleum. Second, the revenues necessary to sustain levels of imports consistent with development plans will require continuous increases in petroleum prices, not only to compensate for the inflation contained in those imported products but to continuously expand import capacity. Therefore, the effect of continued imports on the price of oil is bound to be positive. Again, the 5 percent figure estimated here represents the extent to which those price increases are apt to exceed the extrapolation of the baseline, with that extrapolation representing future prices in constant 1975 dollars. Therefore, we are assuming that price increases will exceed by 5 percent what would be required purely by virtue of the level of inflation of imported manufactured products.

Event 224. The IEA and OPEC Agree to an Indexation Plan for Linking Crude Oil Prices to General Level of Inflation in Manufactured Products.

An indexation plan would probably benefit the major petroleum consumers by stabilizing OPEC prices at levels consistent with, and most likely below, the general level of inflation. Assuming that a realistic rate of inflation, let us say 7 percent, can be agreed to between consumers and producers, a negative impact of 4 percent in real terms below the baseline would seem reasonable. We also believe that the steady state impact will be much less negative, as OPEC countries begin to resist the constraints on import capacity imposed by the indexation scheme. What is likely to eventuate at this point are increased disputes concerning the level of inflation, with the negotiated level taking on increased political issue, which is how much OPEC prices can increase without suppressing demand.

Event 225. North Sea, Mexican, and PRC Oil Enter World Markets in Large Volumes, Causing OPEC Exports to Fall to 25 Million Barrels Per Day or Less.

In this event, the development of alternate petroleum sources cuts into the market share held by OPEC crude oil exports. The assumption of the event as stated is that in response to increased supplies of petroleum, OPEC embarks upon a conscious effort to maintain current price levels by

simply maintaining or reducing production, rather than increasing production and attempting to preempt the markets being developed by new petroleum sources. Thus, the assumption is that OPEC follows a strategy of price maintenance in a short term, rather than high production at the risk of lower prices and maximum market share. However, such a strategt is likely to collapse as those OPEC members--Venezuela, Nigeria, Indonesia--with ambitious development plans and consequently large revenue requirements cut prices and attempt to enlarge their market shares, with the hope of undercutting alternate energy sources from the North Sea, Mexico and the PRC. A price decline of 5 percent has been estimated as a consequence of these forces.

```
00300   -19PRICE OF OPEC CRUDE.
00310   -2  7777 4     51  2  4     3.000  9     1.000 1
00320    04    51    PP*    809000    *    257090
00330   104    51DEVELOPING COUNTRIES FORM CARTELS FOR KEY RAW
00346   114    51MATERIALS:  BAUXITE, MANGANESE, TIN AND
00362   124    51CHROMIUM.
00380   -2  7777 4    171  1  2   -60.000  8   -30.000 1
00390    04   171    PP*    809000    *    051520
00400   104   171OPEC DISSOLVES
00410   -2  7777 4    174  2  4     2.000  4     2.000 1
00420    04   174    PP*    809000    *    151520
00430   104   174UNITED STATES AND OTHER DEVELOPED COUNTRIES
00432   114   174NEGOTIATE MULTILATERAL AGREEMENTS WITH LDC'S,
00434   124   174ASSURING ACCESS TO RAW MATERIAL SUPPLIES FOR
00436   134   174CONSUMER NATIONS, AND STABLE EXPORT
00438   144   174EARNINGS FOR PRODUCING NATIONS.
00440   -2  7777 4    195  1  4     3.000  7     0.000 1
00450    04   195    PP*    809000    *    101015
00460   104   195THE OECD FINANCIAL SUPPORT FUND BECOMES OPERA-
00462   114   195TIONAL, LENDING AT LOW INTEREST RATES TO ANY OECD
00464   124   195COUNTRY SUFFERING BALANCE OF PAYMENTS DEFICITS FROM
00466   134   195PETROLEUM IMPORTS.
00470   -2  7777 4    197  1  5    -5.000 12    -4.000 1
00480    04   197    PP*    809000    *    012535
00490   104   197DEVELOPMENT OF NORTH SEA OIL AND NATURAL GAS,
00492   114   197AND FURTHER GROWTH IN NUCLEAR POWER IN FRANCE
00494   124   197, THE UNITED KINGDOM, ITALY AND WEST GERMANY
00496   134   197ENABLE EUROPE TO SUPPLY 65 PERCENT OF ITS
00498   144   197ENERGY NEEDS.
00500   -2  7777 4    208  1  4    -2.000  7    -1.000 1
00510    04   208    PP*    809000    *    051015
00520   104   208VENEZUELA WITHDRAWS FROM OPEC.
00530   -2  7777 4    218  1 15    -8.000 15    -8.000 1
00540    04   218    PP*    809000    *    101010
00550   104   218THE INERNATIONAL ENERGY AGENCY (IEA) BECOMES A PERMANENT
00552   114   218 ORGANIZATION WITH AUTHORITY OVER AN IEA OIL STOCKPILE,
00554   124   218COMPULSORY SHARING OF OIL DURING EMERGENCIES, OECD WIDE
00556   134   218 ENERGY CONSERVATION AND R AND D, AND AN OECD OIL PRICE
00558   144   218 FLOOR TO ENCOURAGE NEW INVESTMENTS.
00560   -2  7777 4    219  4  9    -3.000 14    -2.000 1
00570    04   219    PP*    809000    *    152020
00580   104   219OPEC COUNTRIES INCREASE THEIR LONG-TERM DIRECT INVESTMEN
00583   114   219T IN DEVELOPED COUNTRIES TO THE LEVEL OF 1/2 THEIR ANNUA
00586   124   219L SURPLUS.
00590   -2  7777 4    220  1  8     5.000  8     5.000 1
00600    04   220    PP*    809000    *    202525
00610   104   220OPEC COUNTRIES CONTINUE TO SPEND LARGE PORTIONS OF THEIR
00615   114   220OIL REVENUES ON IMPORTS OF PRODUCTS AND TECHNOLOGY.
00620   -2  7777 4    221  1  7    -6.000  7    -6.000 1
00630    04   221    PP*    809000    *    253550
00640   104   221A FORMAL SETTLEMENT BETWEEN ISRAEL AND THE FRONT LINE AR
00642   114   221AB COUNTRIES (EGYPT, SYRIA, JORDAN) IS ACHIEVED, EMBODYI
00644   124   221NG GUARANTEES OF ISRAELI SECURITY, BORDER ADJUSTMENTS AN
00646   134   221D RESOLUTION OF THE PALISTINIAN ISSUE.
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TIA Event-Impact Input (Scenario A)

(See p. 2.4 for key to the data.)

```
00550   -2  7777 4    222  1  1    25.000  7    15.000 1
00660    04   222    PP*    809000    *    305070
00570   104   222CONFLICT AGAIN EPUPTS BETWEEN ISRAEL AND THE ARAB STATES
00673   114   222, WITH FURTHER ISRAELI OCCUPATION AND DIPLOMATIC/STRATEG
00676   124   222IC STALEMATE.
00680   -2  7777 4    223  1  3    -2.000  6     0.000 1
00690    04   223    PP*    809000    *    203045
00700   104   223WAR AMONG THE ARAB STATES BREAKS OUT, PITTING THE FRONT
00705   114   223LINE STATES AGAINST IRAN, LYBIA, AND THE PALISTINEANS.
00710   -2  7777 4    224  1  8    -4.000 14    -1.000 1
00720    04   224    PP*    809000    *    255075
00730   104   224THE IEA AND OPEC AGREE TO AN INDEXATION PLAN FOR LINKING
00733   114   224 CRUDE OIL PRICES TO GENERAL LEVEL OF INFLATION IN MANUF
00736   124   224ACTURED PRODUCTS.
00740   -2  7777 4    225  1  7    -5.000  7    -5.000 1
00750    04   225    PP*    809000    *    102040
00760   104   225NORTH SEA, MEXICAN AND PRC OIL ENTER WORLD MARKETS IN LA

00960   114   225RGE VOLUMES, CAUSING OPEC EXPORTS TO FALL TO 25 MILLION
00440   124   225BARRELS PER DAY OR LESS.
```

TIA Event-Impact Input (Scenario A) (Cont.)

(See p. 2.4 for key to the data.)

Population of the European Community

SCENARIOS A AND C

We assume that the European countries, in order to achieve greater personal income levels (Scenario C) or relieve pressures on scarce resources (Scenario A), will implement essentially the same population control measures prevalent in the United States in these scenarios. The assumed growth rate is a constant 0.3 percent annually, which represents a slight increase in the rate prevailing in the United Kingdom between 1970 and 1974.

SCENARIOS B AND D

Here we assume, because of rising affluence and opposition to government intervention (Scenario B) or a general immobility in government policy (Scenario D), an absence of population control and consequent increases in the rate of population growth. The assumed growth rate is a constant 0.7 percent annually, which represents the average of the 0.8 percent growth in French population between 1970 and 1974, and the 0.6 percent growth in West German population during the same period.

SCENARIO R

Here we have used the best fit projection, which results in median values between the two sets of projections above.

Population of Japan

SCENARIOS A AND C

We assume that Japan, for the same reasons pertaining to the European Community and the United States, will implement population control measures. The result is a constant annual growth rate of 1.2 percent, which represents a slight reduction in the 1.3 percent rate prevailing between 1970 and 1974.

SCENARIOS B AND D

We assume that, for the same reasons pertaining to the European Community and the United States, population control measures are not implemented. The result is a constant annual growth rate of 1.6 percent, which represents a slight reduction in the best fit projection of 1.7 percent annual increase by the year 2000.

SCENARIO R

Here we have used the best fit projection, which yields intermediate values between the two sets of projections above.

Population of Latin America

SCENARIOS A AND C

We assume that as a result of the spread of population control technology from the developed countries to Latin America a desire to upgrade personal income (Scenario C) and to relieve pressures on scarce resources (Scenario A), Latin America governments will implement population control measures. The result is an annual growth rate of 2.8 percent, which represents the 3-country average for the period 1960-1961.

SCENARIOS B AND D

In running the fit program for Latin American population, we recorded an increase in annual population growth rates from 3.0 percent in 1976 to 4.2 percent by the year 2000. This would seem to imply a lack of population control measures, a tolerance for substantial population increases, and/or an inability on the part of governments to stem the rise in population. Since these implications are most compatible with Scenarios B and D, the best fit projections were used for these scenarios.

SCENARIO R

We assume a constant annual growth rate of 3.1 percent, which represents the best fit rate of increase at 1980 and only a slight increase over the historical growth rate of 2.9 percent between 1960 and 1974.

NOTE: The growth rates which follow are designed for consistency with (1) GDP growth rate assumptions for the United States in the socioeconomic sector, (2) historical European Community, Japan, and Latin American experience, (3) recent estimates for world GDP growth in the immediate future (see U.S. Department of Commerce, International Economic Indicators [September 1976]), and (4) growth rate assumptions for each region.

Gross Domestic Product of the European Community

SCENARIO A

The initial growth rate for European Community GDP is set at 4.0 percent, which is 0.5 percent below recent and undoubtedly optimistic estimates for European Community GDP through mid-1979. As governments intervene in their economics more aggressively to curtail growth, GDP growth rates decline further to 3.5 percent through 1981, 2 percent through 1989, and then stabilize at 1 percent through the end of the period.

SCENARIO B

The 1976-1977 period is characterized by a 4.3 percent growth rate, followed by government efforts to stimulate European economies and a consequent 4.5 percent growth rate through 1981. As new technologies are introduced and domestic and foreign sales expand, the growth rate rises to 5.1 percent through 1989, then stabilizes at 5.5 percent.

SCENARIO C

Growth rates here parallel those of Scenario B, but at a slightly lower level because of diminishing population growth. Thus, the following growth rates have been assigned: 4.3 percent through 1977, 4.4 percent through 1981, 4.9 percent through 1989, and 5.2 percent through 2000.

SCENARIO D

Growth rates for the period through 1977 are 4.1 percent, with resource scarcities, reduction of trade flows, and restrictive economic policies reducing this rate to 3.6 percent through 1981, 2.7 percent through 1991, and 2.1 percent through 2000.

SCENARIO R

The initial growth rate of 4.2 percent is reduced through conscious government policy to 4.0 percent through 1982, then stabilizes at 3.5 percent through the end of the period. This rate reflects a greater degree of government economic management aimed at nearly full employment and moderate inflation, combined with modest population growth and introduction of new production technologies.

Gross Domestic Product of Japan

SCENARIO A

In this limited growth scenario the initial period is characterized by a 5.5 percent growth rate (recent Japanese estimates of a 6.9 percent growth rate for the fiscal year ending March 1977 seem optimistic). As growth-limiting efforts take hold, growth rates are gradually reduced to 4.8 percent through 1981, 3.7 percent through 1991, and 2.5 percent through 2000. The trend--as is also the case below--parallels assumptions applied to European Community GDP.

SCENARIO B

Initial growth of 6.6 percent is further stimulated by expansionary fiscal and monetary policies. Favorable business treatment, increased international trade, and technological innovations increase GDP growth to levels of 7.2 percent through 1981 and 7.6 percent through 2000.

SCENARIO C

Growth rates parallel those assigned to Scenario B, but at a slightly lower level, which reflects reductions in the rate of population increase.

SCENARIO D

Initial growth of 5.6 percent gives way to a rate of 5.1 percent as resource supplies are curtailed, foreign trade barriers to Japanese exports are raised, and government economic policy follows no consistent pattern. Subsequent rates are 4.5 percent through 1989 and 3.3 percent through 2000.

SCENARIO R

Growth rates for this scenario most closely resemble a forecast. Rates of 6.1 percent through 1978, 5.7 percent through 1982, and 5.4 percent through 2000 have been assigned. These rates approximate those of the 1967-1971 period, are probably sustainable without prohibitive inflation, and are consistent with the scenario, which posits significant international trade growth, uninterrupted access to raw material, and increased rates of technological innovation.

Gross Domestic Product of Latin America

SCENARIO A

For this scenario we utilized the projections emerging from our best-fit program, since the data matched our expectations of modest and declining growth rates throughout the period. Selected rates of increase are 3.8 percent between 1976 and 1977, 2.8 percent between 1983 and 1984, 1.8 percent between 1991 and 1992, and 1.1 percent between 1999 and 2000.

SCENARIO B

In this expansive growth scenario we posited a 4.5 percent rate of increase through 1980, 5.9 percent through 1987, 6.8 percent through 1994, and 7.7 percent through 2000. These rates reflect increased personal income and continued rapid population increases.

SCENARIO C

Rates of increase again parallel those assigned to Scenario B, but at a slightly lower level because of successful population control efforts by the governments involved. This yields increases of 4.4 percent through 1980, 5.5 percent through 1987, and 6.7 percent through 2000.

SCENARIO D

Growth rates for the hardship scenario begin at 4.0 percent, then descend to 3.4 percent through 1987, to 2.7 percent through 1994, and stabilize at 1.9 percent. These rates reflect an attenuation in trade, a hostile investment climate, and stagnation in technological innovation.

SCENARIO R

Growth rates reflect a cooperative international economic environment government programs to stimulate investment and new technologies, and modest population growth. The assigned rates are 4.1 percent through 1980, 4.5 percent through 1987, and 4.8 percent through 2000.

Federal Expenditures for Non-Defense Aeronautical Research and Development

BASELINE

The baselines for this indicator were generated using a regression equation which correlated the research and development variable against GNP [R&D = f(GNP)]. The equation used data from 1950 to 1975. To obtain the baselines, the values of GNP for each of the five scenarios from 1976 to 2000 were put in the equation, which then yielded five baseline projections of R&D. Historically Federal non-defense aeronautical research and development has increased at a 6.4 percent annual rate while GNP has increased about 3.3 percent annually over the same period (1950-1975). Thus, when the future values of GNP are used to project the R&D indicator, the indicator grows more rapidly than GNP. Of course, growth rates of the R&D indicator in each scenario are influenced by events and event probabilities.[7]

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[7]Source of Historical Data: Charles R. Hudson, Jr., Research and Development Contributions to Aviation Progress (RADCAP), Vol. II, Appendices 1-9, U.S. Wright-Patterson Air Force Base, Aeronautical Systems Division, NASA-CR-129573 (Available from National Technical Information Service, Springfield, Va., N73-13983, August 1972), Table 3, p. 14; with telephoned update.

NOTE: Figures for 1974 and 1975 were not available. These were estimated by applying the percentage increase in spending in 1974 and 1975 for Federal Air Transport Research and Development. These figures were obtained from National Science Foundation, An Analysis of Federal R&D Funding by Function, Report NSF 75-330, p. 71.

Regression Equation

POLYNOMIAL REGRESSION.....

DEPENDENT VARIABLE (Y) FNDRAD
INDEPENDENT VARIABLE (X) GNP

NUMBER OF OBSERVATIONS 22
DETERMINAT OF THE INVERSE MATRIX 1.000E+00

POLYNOMIAL REGRESSION OF DEGREE 1

POLYNOMIAL DEGREE IN X	CORRELATION X VS Y	REGRESSION COEFFICIENT	STD.ERROR OF REG.COEF	COMPUTED T VALUE
1	0.9348	.73443	.62378E-01	11.774

REGRESSION INTERCEPT	-520.06
MULTIPLE CORRELATION	.93483
STD. ERROR OF ESTIMATE	75.283
COEFF OF DETERMINATION	.87391

```
FA1087
00010     1087   1950   1975   1976   2000   1975      14      0.000    3900.000
00020    0.82939364                          0.04      -3.45
00030     1950          119.40          91.49
00040     1951          146.70          99.40
00050     1952          254.50         107.96
00060     1953          170.70         117.24
00070     1954          119.40         127.29
00080     1955          100.20         138.17
00090     1956          105.20         149.95
00100     1957           99.30         162.69
00110     1958          115.60         176.44
00120     1959          143.20         191.30
00130     1960          148.30         207.34
00140     1961          154.30         224.64
00150     1962          194.80         243.30
00160     1963          259.60         263.38
00170     1964          245.00         284.99
00180     1965          262.00         308.22
00190     1966          419.40         333.16
00200     1967          578.10         359.91
00210     1968          393.00         388.57
00220     1969          437.30         419.24
00230     1970          560.00         452.00
00240     1971          719.60         486.96
00250     1972          528.10         524.19
00260     1973          524.40         563.79
00270     1974          646.00         605.83
00280     1975          558.00         650.37
00290     1976            0.00         649.20
00300     1977            0.00         698.40
00310     1978            0.00         737.30
00320     1979            0.00         774.00
00330     1980            0.00         807.1
00340     1981            0.00         835.40
00350     1982            0.00         865.1
00360     1983            0.00         892.2
00370     1984            0.00         918.0
00380     1985            0.00         938.5
00390     1986            0.00         957.6
00400     1987            0.00         973.8
00410     1988            0.00         988.5
00420     1989            0.00        1003.9
00430     1990            0.00        1018.6
00440     1991            0.00        1034.0
00450     1992            0.00        1050.2
00460     1993            0.00        1065.6
00470     1994            0.00        1081.7
00480     1995            0.00        1094.2
00490     1996            0.00        1107.4
00500     1997            0.00        1119.9
00510     1998            0.00        1133.1
00520     1999            0.00        1146.4
00530     2000            0.00        1159.6
```


Baseline Scenario A (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA2087
00010     1087   1950   1975   1975   2000   1976      14      0.000   3800.000
00020  0.82939354                          0.04          -3.45
00030  1950          119.40          91.49
00040  1951          146.70          99.40
00050  1952          254.50         107.96
00060  1953          179.70         117.24
00070  1954          119.40         127.29
00080  1955          100.80         138.17
00090  1956          105.20         149.95
00100  1957           99.80         162.68
00110  1958          115.60         176.44
00120  1959          143.20         191.30
00130  1960          148.30         207.34
00140  1961          154.30         224.64
00150  1962          194.80         243.30
00160  1963          259.60         263.38
00170  1964          245.00         284.99
00180  1965          262.00         308.22
00190  1966          419.40         333.16
00200  1967          578.10         359.91
00210  1968          393.00         388.57
00220  1969          437.30         419.24
00230  1970          560.00         452.00
00240  1971          719.60         486.96
00250  1972          528.10         524.19
00260  1973          524.40         563.79
00270  1974          645.00         605.83
00280  1975          558.00         650.37
00290  1976            0.00         549.2
00300  1977            0.00         721.9
00310  1978            0.00         781.3
00320  1979            0.00         842.3
00330  1980            0.00         905.5
00340  1981            0.00         967.9
00350  1982            0.00        1033.3
00360  1983            0.00        1101.6
00370  1984            0.00        1172.8
00380  1985            0.00        1247.7
00390  1986            0.00        1332.2
00400  1987            0.00        1421.0
00410  1988            0.00        1514.3
00420  1989            0.00        1616.4
00430  1990            0.00        1722.9
00440  1991            0.00        1835.3
00450  1992            0.00        1957.9
00460  1993            0.00        2086.4
00470  1994            0.00        2222.3
00480  1995            0.00        2354.8
00490  1996            0.00        2514.6
00500  1997            0.00        2672.5
00510  1998            0.00        2254.10
00520  1999            0.00        3013.3
00530  2000            0.00        3196.9
```


Baseline Scenario B (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA3087
00010     1087   1950    1975    1976    2000    1976       14        0.000    3800.000
00020  0.02939354                                  0.04          -3.45
00030     1950          119.40          91.49
00040     1951          146.70          99.40
00050     1952          254.50         107.96
00060     1953          170.70         117.24
00070     1954          119.40         127.29
00080     1955          100.20         138.17
00090     1956          105.20         149.95
00100     1957           99.80         162.68
00110     1958          115.60         176.44
00120     1959          143.20         191.30
00130     1960          148.30         207.34
00140     1961          154.30         224.64
00150     1962          194.80         243.30
00160     1963          259.60         263.38
00170     1964          245.00         284.99
00180     1965          262.00         308.22
00190     1966          419.40         333.16
00200     1967          575.10         359.91
00210     1968          393.00         388.57
00220     1969          437.30         419.24
00230     1970          550.00         452.00
00240     1971          719.60         486.96
00250     1972          528.10         524.19
00260     1973          524.40         563.79
00270     1974          646.00         605.33
00280     1975          558.00         650.37
00290     1976            0.00         697.46
00300     1977            0.00         721.9
00310     1978            0.00         781.3
00320     1979            0.00         842.3
00330     1980            0.00         905.5
00340     1981            0.00         966.4
00350     1982            0.00        1030.3
00360     1983            0.00        1096.4
00370     1984            0.00        1166.9
00380     1985            0.00        1238.9
00390     1986            0.00        1319.7
00400     1987            0.00        1404.9
00410     1988            0.00        1493.0
00420     1989            0.00        1590.0
00430     1990            0.00        1614.58
00440     1991            0.00        1797.1
00450     1992            0.00        1913.1
00460     1993            0.00        2035.0
00470     1994            0.00        2162.1
00480     1995            0.00        2296.5
00490     1996            0.00        2437.5
00500     1997            0.00        2585.1
00510     1998            0.00        2740.8
00520     1999            0.00        2903.8
00530     2000            0.00        3075.0
```


Baseline Scenario C (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
FA4037
00010     1087   1950    1975    1976    2000    1975      14        0.000    3600.000
00020  0.82939364                          0.04          -3.45
00030     1950          119.40            91.49
00040     1951          146.70            99.40
00050     1952          254.50           107.96
00060     1953          170.70           117.24
00070     1954          119.40           127.29
00080     1955          100.20           138.17
00090     1956          105.20           149.95
00100     1957           99.80           162.68
00110     1958          115.60           176.44
00120     1959          143.20           191.30
00130     1960          148.30           207.34
00140     1961          154.30           224.64
00150     1962          194.80           243.30
00160     1963          259.60           263.38
00170     1964          245.00           284.99
00180     1965          262.00           308.22
00190     1966          419.40           333.16
00200     1967          578.10           359.91
00210     1968          393.00           388.57
00220     1969          437.30           419.24
00230     1970          560.00           452.00
00240     1971          719.60           486.96
00250     1972          528.10           524.19
00260     1973          524.40           563.79
00270     1974          646.00           605.83
00280     1975          558.00           650.37
00290     1976            0.00           649.2
00300     1977            0.00           698.4
00310     1978            0.00           737.3
00320     1979            0.00           769.6
00330     1980            0.00           803.4
00340     1981            0.00           837.9
00350     1982            0.00           871.7
00360     1983            0.00           904.7
00370     1984            0.00           936.3
00380     1985            0.00           962.8
00390     1986            0.00           986.3
00400     1987            0.00          1009.0
00410     1988            0.00          1032.5
00420     1989            0.00          1055.3
00430     1990            0.00          1078.8
00440     1991            0.00          1103.0
00450     1992            0.00          1127.3
00460     1993            0.00          1152.2
00470     1994            0.00          1175.7
00480     1995            0.00          1197.8
00490     1996            0.00          1219.8
00500     1997            0.00          1242.6
00510     1998            0.00          1263.9
00520     1999            0.00          1285.2
00530     2000            0.00          1306.5
```


Baseline Scenario D (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

```
=A5087
00010     1087   1950   1975   1976   2000   1976      14       0.000    3800.000
00020  0.82939364                          0.04        -3.45
00030     1950          119.40              91.49
00040     1951          146.70              99.40
00050     1952          254.50             107.96
00060     1953          170.70             117.24
00070     1954          119.40             127.29
00080     1955          100.20             138.17
00090     1956          105.20             149.95
00100     1957           99.80             162.68
00110     1958          115.60             176.44
00120     1959          143.20             191.30
00130     1960          148.30             207.34
00140     1961          154.30             224.64
00150     1962          194.80             243.30
00160     1963          259.60             263.38
00170     1964          245.00             284.99
00180     1965          262.00             308.22
00190     1966          419.40             333.16
00200     1967          578.10             359.91
00210     1968          393.00             388.57
00220     1969          437.30             419.24
00230     1970          560.00             452.00
00240     1971          719.60             486.96
00250     1972          528.10             524.19
00260     1973          524.40             563.79
00270     1974          646.00             605.83
00280     1975          558.00             650.37
00290     1976            0.00             649.2
00300     1977            0.00             721.7
00310     1978            0.00             776.2
00320     1979            0.00             825.4
00330     1980            0.00             882.0
00340     1981            0.00             934.8
00350     1982            0.00            986.3
00360     1983            0.00            1038.4
00370     1984            0.00            1093.5
00380     1985            0.00            1150.0
00390     1986            0.00            1205.1
00400     1987            0.00            1261.7
00410     1988            0.00            1321.2
00420     1989            0.00            1382.1
00430     1990            0.00            1438.7
00440     1991            0.00            1497.4
00450     1992            0.00            1555.4
00460     1993            0.00            1620.9
00470     1994            0.00            1684.7
00480     1995            0.00            1750.8
00490     1996            0.00            1819.1
00500     1997            0.00            1888.9
00510     1998            0.00            1961.6
00520     1999            0.00            2035.8
00530     2000            0.00            2112.1
```


Baseline Scenario R (millions of 1975 dollars)

(See p. 2.4 for key to the data.)

EVENT-IMPACT RATIONALE

Event 54. The DOD Budget Increases to at Least 50 Percent of the Federal Budget (About 27 Percent in 1975).

The occurrence of this event would cause a large increase in Federal spending for defense-oriented aeronautical research and development. As these defense applications grow, it was assumed that there would be spill-overs into non-defense aeronautical research and development. This "pulling along" was assumed to increase this variable by 2 percent.

Event 63. R&D Spending in United States Increases from the 1974 Level of 2.5 Percent of GNP to 5 Percent of GNP.

With the increased spending implied by this event, Federal non-defense aeronautical R&D would most certainly increase. This would result from a simple increase in government funding and also as a reponse to private R&D in order to maintain and support a smooth functioning and well integrated NAS. The impact was set at +5 percent.

Event 65. The Transportation, Communication, and Energy Industries Become Either Public or Quasi-Public Enterprises.

Since this event implies a significant shift of activity from the private to the public sector, it seems clear that the Federal Government would have to assume some responsibility for R&D expenditures that had previously been funded by private industry. It was assumed that this shift would result in a 5 percent increase for this indicator.

Event 77. Congress Enacts a New Tax on Goods and Services Proportional to Their Environmental Impact, Allocating These Funds for Environmental Improvements.

This new tax would of course fall on aviation activities since there is a significant environmental impact caused by air and noise pollution. This revenue raised by taxing the private sector would then be transferred to Federal programs which would conduct R&D to ameliorate these adverse impacts. It was assumed that this tax transfer would increase Federal non-defense aeronautical R&D by 3 percent.

Event 78. Federal Funds for Community Development to Revitalize Cities Increase Threefold over the 1975 Level. (Community Development Funds Totaled $3.2 Billion in 1975.)

It was assumed that if Federal policy focused in part on actively aiding cities, cutbacks in funding other areas would result. Therefore a nominal 1 percent decrease was the impact used.

Event 82. A Progressive Tax Is Imposed on All Energy Usage with the Proceeds Funneled into Energy Production and Conservation R&D Programs.

Since air transport consumes significant amounts of fuel this tax would raise user costs. The tax collected would result in a simple transfer of funds into the R&D programs which would focus in part on more economical fuel use by the air transport industry. This transfer of funds was assumed to result in a 2 percent increase in Federal non-defense aeronautical R&D.

Event 152. Federal Reserve Adopts Constant Growth Policy as Regards the Monetary Aggregates (I.E., M_1 Grows at 6 Percent) and Thus Dispenses with Monetary Policy as a Discretionary Tool, and the Federal Budget Is Balanced on an Expenditure Basis.

This event implies that the Federal Government assumes a somewhat less active role in the economy. In doing so the government would promote and encourage private initiatives in Federal non-defense aeronautical R&D. While Federal support of this type of R&D would most likely decrease there would continue to be a need for Federal support in insuring the coordination of the NAS. This reduction in the Federal role was assumed to cause a 5 percent decrease in this variable.

Event 172. European Community and Japan Erect Prohibitive Trade and Investment Restrictions Which Effectively Deny Market Access to the United States.

This event would lessen the amount of intercourse between the United States and these countries. It was assumed that this decline in activity would result in a small decrease in Federal non-defense aeronautical R&D. There would be less pressure on the Federal infrastructure that supports the NAS and, in general, foreign use of domestic facilities would decrease. The impact is quite marginal and was assigned a nominal 1 percent decrease.

```
00540   -19FED R&D AEROND A
00550   -2  7777 4      54  1  5     2.000 10     0.500 1
00560    04    54    PP*    809000     *    050510
00570   104    54THE DOD BUDGET INCREASES TO AT LEAST 50% OF THE
00580   114    54FEDERAL BUDGET (ABOUT 27% IN 1975).
00590   -2  7777 4      62  3  7    -2.000 12    -1.000 1
00600    04    62    PP*    809000     *    152020
00610   104    62A FOURTH LEVEL OF GOVERNMENT IS CREATED IN
00615   114    62THE FORM OF MANY REGIONAL AUTHORITIES TO
00620   124    62ADMINISTER SPECIFIC FUNCTIONS (E.G., TRANS-
00625   134    62PORTATION, RESOURCES, THE ENVIRONMENT, ETC.)
00630   144    62NOW RESIDING IN FEDERAL, STATE AND MUNI-
00635   154    62PAL GOVERNMENTS.
00640   -2  7777 4      63  1  2     5.000  8     2.000 1
00650    04    63    PP*    809000     *    102030
00660   104    63R&D SPENDING IN THE U.S. INCREASES FROM THE MID
00665   114    6319705 LEVEL OF 2.5 PERCENT OF GNP TO 5
00670   124    63PERCENT OF GNP.
00680   -2  7777 4      65  2  4     5.000  8     0.500 1
00690    04    65    PP*    809000     *    010510
00700   104    65THE TRANSPORTATION, COMMUNICATION AND ENERGY
00710   114    65INDUSTRIES BECOME EITHER PUBLIC OR QUASI-
00720   124    65PUBLIC ENTERPRISES.
00740   -2  7777 4      77  2  5     3.000 10     1.000 1
00750    04    77    PP*    809000     *    304060
00760   104    77CONGRESS ENACTS A NEW TAX ON GOODS AND SERVICES
00770   114    77PROPORTIONAL TO THEIR ENVIRONMENTAL IMPACT,
00780   124    77ALLOCATING THESE FUNDS FOR ENVIRONMENTAL
00790   134    77IMPROVEMENTS.
00800   -2  7777 4      78  1  3    -1.000  8    -0.200 1
00810    04    78    PP*    809000     *    205070
00820   104    78FEDERAL FUNDS FOR COMMUNITY DEVELOPMENT, TO
00830   114    78REVITALIZE CITIES, INCREASE THREEFOLD OVER THE
00840   124    781975 LEVEL.  (COMMUNITY DEVELOPMENT FUNDS
00850   134    78TOTALLED $3.2 BILLION IN1975).
00860   -2  7777 4      82  1  4     2.000  8     1.000 1
00870    04    82    PP*    809000     *    306070
00880   104    82A PROGRESSIVE TAX IS IMPOSED ON ALL ENERGY
00890   114    82USAGE WITH THE PROCEEDS FUNNELED INTO ENERGY
00900   124    82PRODUCTION AND CONSERVATION R&D PROGRAMS.
00910   134    82ENERGY R&D AND CONSERVATION PROGRAMS.
00920   -2  7777 4     152  1  3    -5.000  5    -2.000 1
00930    04   152    PP*    809000     *    010101
00940   104   152FEDERAL RESERVE ADOPTS CONSTANT GROWTH POLICY
00944   114   152AS REGARDS THE MONETARY AGGREGATES (I.E., M1
00948   124   152GROWS AT 6 PERCENT) AND THUS DISPENSES WITH
00952   134   152MONETARY POLICY AS A DISCRETIONARY TOOL,
00956   144   152AND THE FEDERAL BUDGET IS BALANCED.
00960   -2  7777 4     172  2  5    -1.000 10    -0.200 1
00970    04   172    PP*    809000     *    151520
00980   104   172EUROPEAN COMMUNITY AND JAPAN ERECT PROHIBITIVE
00990   114   172TRADE AND INVESTMENT RESTRICTIONS WHICH
01000   124   172EFFECTIVELY DENY MARKET ACCESS TO THE U.S.
```

TIA Event-Impact Input--Scenario A

(See p. 2.4 for key to the data.)

Appendix

TREND IMPACT ANALYSIS

Trend Extrapolation

The ability to quantify various parameters and project them into the future is an important factor in accomplishing the various steps in the planning process. Many techniques are and have been used to obtain such time series data. These range from highly judgmental, intuitive methods to highly complex mathematical treatments. In the former case, individual estimates (genius, expert, or nonexpert) or group consensus (obtained by polling, face-to-face conferences, Delphi conferences, or situation gaming) may be employed.

Unfortunately, both human judgment and mathematical extrapolation have their own fallibilities. Past combinations of the two have not been notably successful in combining the best features of each while avoiding their weaknesses. A principal strength of judgment in trend extrapolation is that humans can take into account the possible impacts of unprecedented future events that may cause unique perturbations in the trends. For example, a pharmaceutical industrialist or food manufacturer might be interested in how the discovery of a link between pancreatic cancer and the consumption of sugar would influence the trend in sales of artificial sweeteners. This influence, however, could manifest itself in quite novel ways since, by its very nature, it has never been felt before. Common mathematical methods of extrapolation are unable to take into account potential future events since the past history of a

trend cannot reveal how it would be influenced by such events.

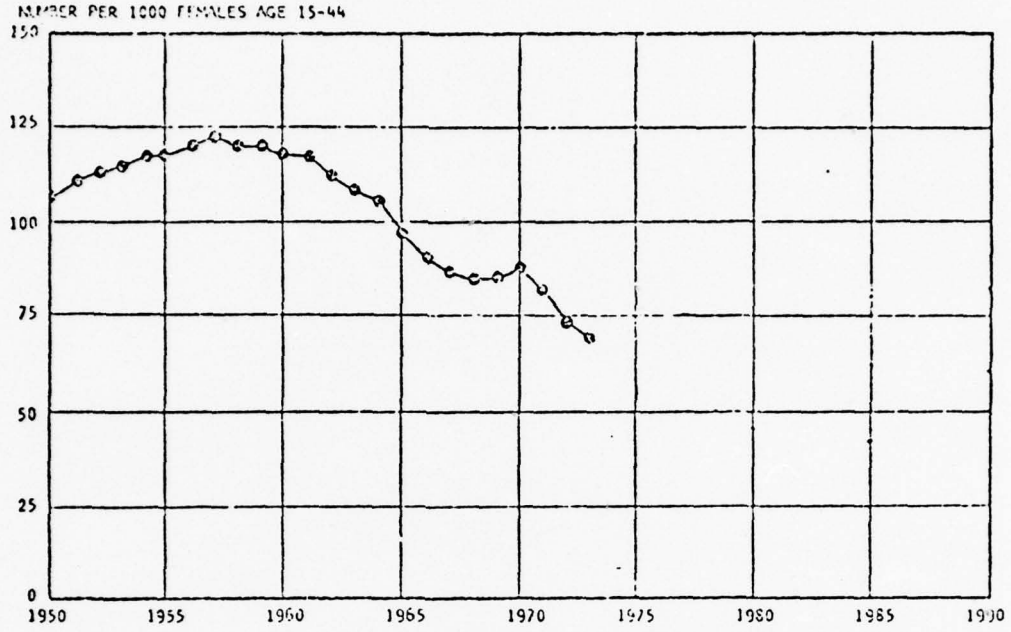
On the other hand, subjective or unaided human judgment is usually inferior to mathematical formulas when it comes to fitting a set of points with a best-fit curve. Moreover, mathematical curve-fitting techniques are well established in theory and application. They can be readily communicated and used by others, thereby overcoming the stigma of arbitrariness or mere idiosyncrasy that attends subjective projections. At best, however, a mathematical approach simply produces a good estimate of how a trend would appear if it were not modified by unprecedented future events.

Three examples illustrate how the occurrence of unprecedented events can influence a previously stable trend.

1. Until about 1955 the fertility rate in the United States rose regularly and smoothly. The trend reversed dramatically in the 1960's when cheap and effective contraceptives permitted the expression of new values and attitudes about ideal family size (see Figure 1). Extrapolations based on the historical trend from 1950 through 1960 consistently over-estimated the present birth rate in the United States.

2. Figure 2 illustrates the long-term drop in the cost of electricity in the United States. The trend toward diminishing costs began almost with the advent of the first electricity generating system and reflected the generally unstated goal of producing cheap power. Cost was reduced through economies of scale, improved technology and operating efficiency, more readily available fuels, etc. Recently, however, the cost of electricity has stabilized and begun to rise because of increasing costs of fuel, new requirements for costly anti-pollution devices, and restrictions on the size of generating plants that end or lower savings through economies of scale. An extrapolation based on all but the latest data would have missed the recent "turn-around."

D 2. FERTILITY RATE[1]



Source of historical data: Public Health Service, National Center for Health Statistics, *Vital Statistics of the United States, 1968*, Vol. I, *Monthly Vital Statistics Reports*, Vol. 19, No. 13; Vol. 20, No. 13; and Vol. 21, No. 12, as cited in Executive Office of the President, Office of Management and Budget, *Social Indicators 1973*, Table 8/5, p. 252; U.S. Bureau of the Census, *Statistical Abstract of the United States 1974* (Washington, D.C.: U.S. Government Printing Office, 1974), Table No. 9, p.11.

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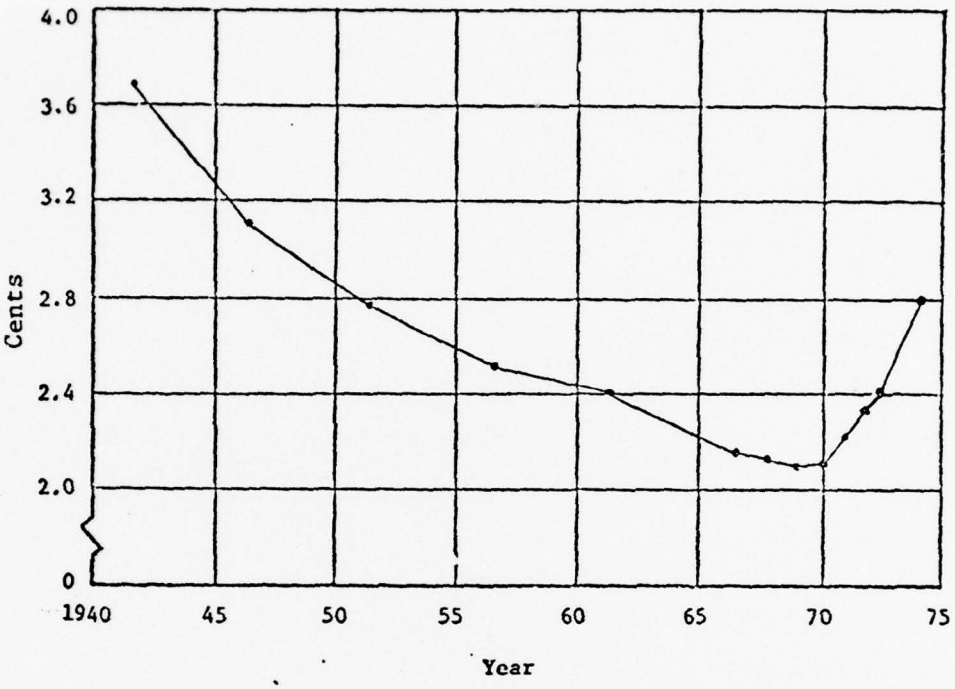
[1]General fertility rate is the number of births per 1,000 resident females 15 to 44 years of age.

Figure 1. Fertility rate in the United States



Source: Edison Electric Institute, Questions and Answers About the Electric Utility Industry, annual.

Figure 2. Electricity used in the home. Average cost per kilowatt-hour

3. The long-term trend in the United States toward the sale of automobiles of increasingly greater weight and horsepower has begun to change appreciably in recent months. This change may be the result of concern about increasing costs of gasoline, new public attitudes about conservation of the environment, or both.

Many other examples can, of course, be cited. The point is that deviations from historically based extrapolations usually seem to reflect the impact of unprecedented events.

Trend Impact Analysis (TIA), an analytic procedure newly developed by The Futures Group, divides the task of extrapolation in such a way that humans and computers are assigned precisely the task that each does best. First, the computer extrapolates the past history of a trend. Second, the human specifies a set of unique future events and how the extrapolation would be changed by the occurrence of each of these events. The computer then uses these judgments to modify the trend extrapolation. Finally, the human evaluates the resultant adjusted extrapolation and modifies the input data to the computer in those cases where the output appears unreasonable. Figure 3 schematically shows this procedure.

Mathematical Trend Extrapolation

The development of a surprise-free extrapolation is the first step in the TIA process. A computer program selects the "best-fitting" curve from a set of alternative equations. This curve is then used to provide the surprise-free future extrapolation. At the option of the program user, in order to avoid unreasonable extrapolations, the program can either truncate extrapolations that fall outside upper or lower bounds or select the "best-fitting" curve only from among those that do not give rise

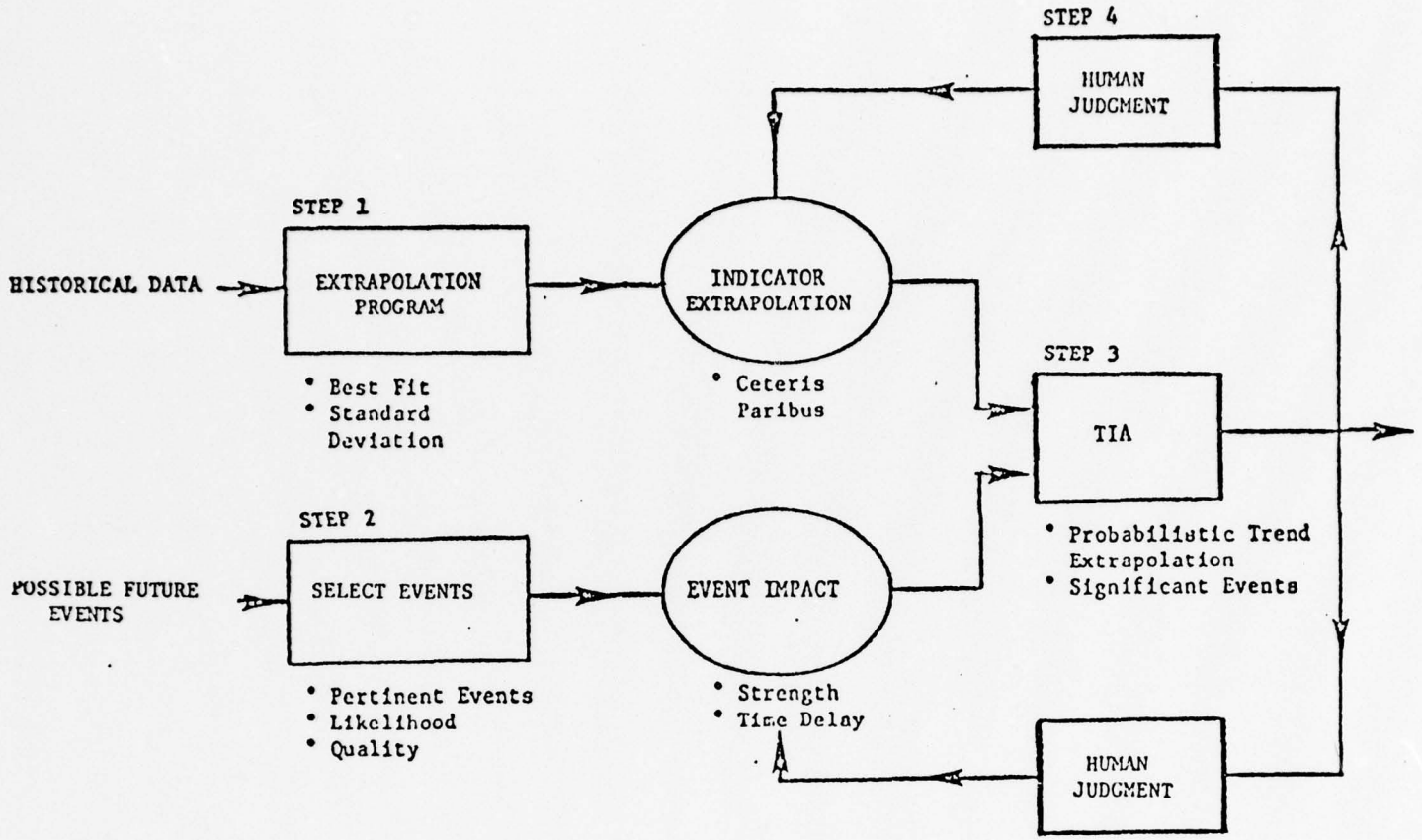


Figure 3. Trend impact analysis (TIA)

to extrapolations falling outside the specified bounds. Alternatively, the user can reject the mathematical extrapolation generated by the TIA program and supply an extrapolation developed by some other curve-fitting program or one based entirely on human judgment.

Several refinements in the programming of this aspect of TIA enhance the effectiveness of the best-fit test and extrapolation procedure.

1. It is not necessary that the data cover a continuous span of time. Data in which there are gaps are fully acceptable--the program makes use of whatever data are available, taking into account any gaps, but without being stymied by them.

2. The program does not give equal weight to all data. Rather, a year may be specified (normally the present year) for which data are to be given maximum weight. As the times to which the data refer are further removed from the year which has maximum weight, the data are given less weight.* This procedure thus takes into account the possibly lower reliability of data that are more distant in the past or, more important perhaps, the lower influence on the future of developments that have occurred progressively farther in the past. The formula chosen also makes the sum of an infinite number of weights infinite, rather than convergent, so that even very distant years continue to have a finite contribution.

3. Since there is no guarantee that a mathematical extrapolation will give a good fit to the given data, the TIA program reports to the human user just how good the fit was, using the same squared correlation coefficient that determined which mathematical formula should be used. As noted earlier, where judgment or analysis indicates a more realistic set of data should be used, they can be input directly as part of the specified data used for subsequent steps.

4. Upper and lower limits on the extrapolation may be set. In this case any curve that produces an extrapolation that exceeds these limits will be rejected. Thus the extrapolation is based on the best-fitting curve that does not exceed the specified limits.

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*The weighting formula is $\frac{1}{1+|y-y_0|}$, where y is a given year and y_0 is the year given maximum weight.

Human Judgments of Event Impacts

Human judgment and imagination are central to the second step of TIA. Here, the program modifies the surprise-free extrapolation to take into account important, unprecedented future events. First a list of such events is prepared. These events should be unprecedented, plausible, potentially powerful in impact, and verifiable in retrospect. The source of this list of events might be, typically, a literature search, a Delphi study, or a consensus among consultants. Whatever the source, the events selected comprise an inventory of potential forces which could lead to a departure from a surprise-free future.

Several judgments are made about each selected event. First, estimates are made of the probability of occurrence of each event as a function of time. Second, the impact of each event on the trend under study is estimated. Impacts can be specified in several ways; our procedure (Figure 4) involves specification of

1. The time from the occurrence of the impacting event until the trend begins to respond.
2. The time from the occurrence of the impacting event until the impact on the trend is largest.
3. The magnitude of that largest impact.
4. The time from the occurrence of the impacting event until the impact reaches a final or steady state level.
5. The magnitude of that steady state impact.

Each of the three specified times and the impact magnitudes associated with them are taken to be completely independent. For example, the maximum impact might be positive and the steady state impact negative, or the

steady state impact might be zero, meaning that the impact is only temporary. Finally, the maximum impact might be the same as the steady state impact.

In addition, impacts can be specified in either relative or absolute units--i.e., they can be specified as percentages of the values of the trends at the time of impact, as a percentage change of that number, or in absolute units of magnitude of the trend. For example, the impact of a particular event on the number of dentists could be specified either as 90 percent of that number, as a 10 percent decline of that number, or as a downward shift of 12,000. The form used to record these estimates is shown in Figure 5. These impacts are calculated, when sufficient information is available to do so. Otherwise they are judgmentally determined.

Computer Processing of Impact on Extrapolated Trends

The heart of TIA is the computer program which uses these judgments to calculate the expected impact of the selected events on the extrapolated trend. A closed-form procedure is used to solve this problem. The expected value, or mean, of the impact and upper and lower quartiles of the distribution of possible impacts are computed for each indicator. The expected value of the impact is computed by summing the products of the probabilities of the impacting events for each possible year times the magnitude of their impact, taking into account their specified time lays. Probabilities of events for years not specified are estimated by linear interpolation, assuming that an event has 0.00 probability at the present time. Similarly, impacts are linearly interpolated between the three specified impact magnitudes.

INDEX NO.		ESTIMATED PROBABILITY BY YEAR SHOWN PROB.	YEAR	YEARS TO FIRST IMPACT	YEARS TO MAXIMUM IMPACT	MAXIMUM IMPACT (PERCENT)	YEARS TO STEADY STATE IMPACT	STEADY STATE IMPACT (PERCENT)
021277	SINGLE UNIT DRUG PACKAGING ACCOUNTS FOR AT LEAST 50% OF DRUG PRODUCTS SALES.	0.99	1975	1	10	-5	10	-5

ESTIMATES PROVIDED BY EXPERTS

Figure 5. Format for event impacts

This approach treats the coupling among the impacts of the various events as negligible. Thus the impact estimate is produced as the sum of independent random variables. The net result is that the variance of the impact-adjusted forecast is the sum of the variance of the trend extrapolation (as measured by the square of the standard error of estimate) and the variances of the impacts of the associated events.

Thus, where P_{ye} is the likelihood that event e will occur in year y, and $a_{y_k-y,e}$ is the impact that event e would give rise to (y_k-y) years after its occurrence, the expected value of the impact in year y_k would be $\sum_e \sum_{y=y_o}^{y_k} P_{ye}\, a_{y_k-y,e}$ where y_o is the present year (e.g., 1975). (See Figure 6.)

Typical TIA Results

Use of the TIA procedure has revealed that important insights may be obtained by utilizing this form of trend extrapolation. The development of improved trend forecasts is only one of the advantages of this method. Insight into how adjustments of event probabilities and impacts vary the estimated future value of the indicator in question, in terms of both the median and interquartile range, can also prove to be very useful in developing an understanding of the effectiveness of policies or actions which may be available to us.

The forecast of the indicator shown in Figure 7, the average cost of a prescription, is drawn from a recent report which is part of a data service (called PROSPECTS) developed at The Futures Group. The forecasts in the

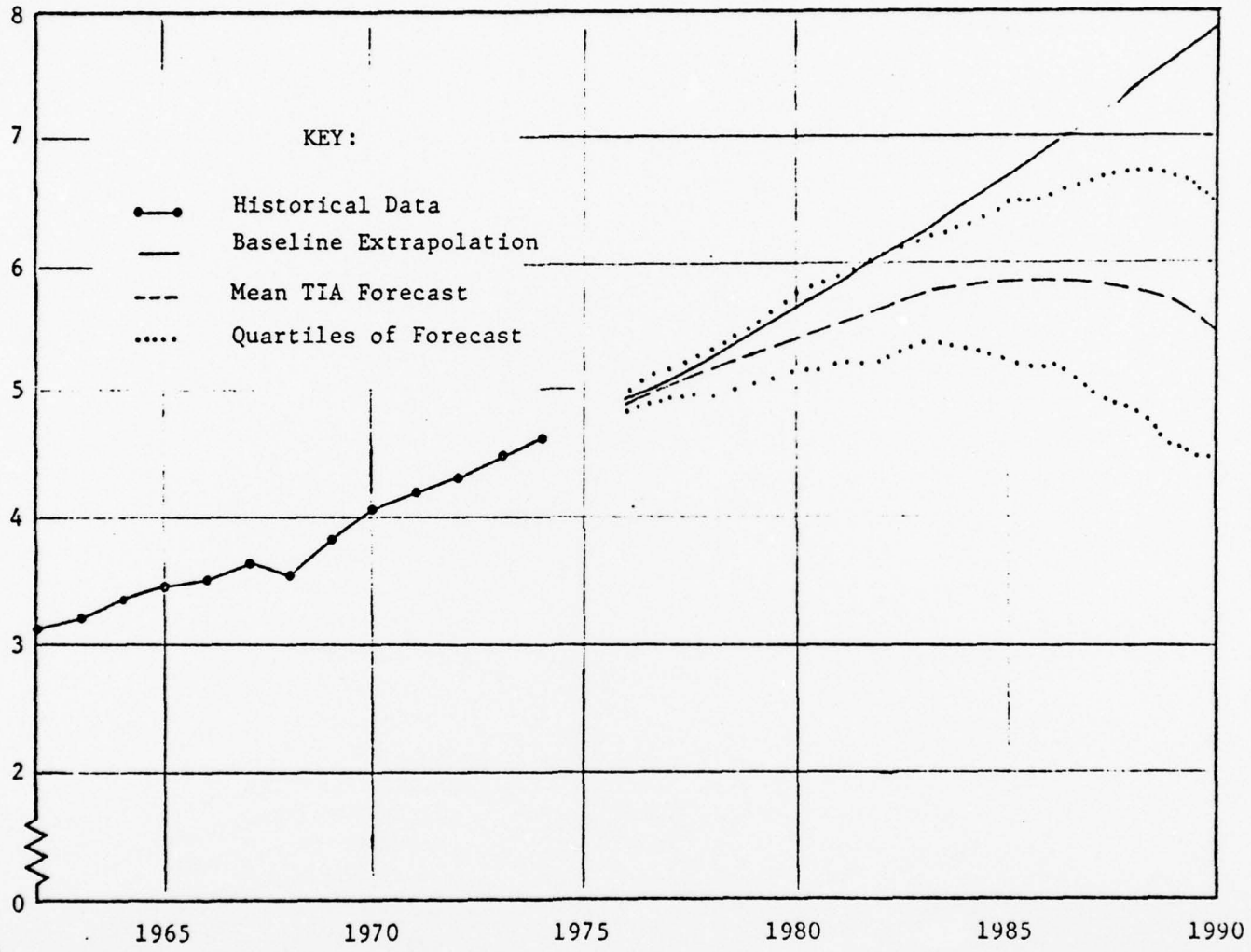
YEAR OF EVENT OCCURRENCE	1975	1976	1977	1978	1979
1979	-	-	-	-	$P_{79}X\ I_0$
1978	-	-	-	$P_{78}X\ I_0$	$P_{78}X\ I_1$
1977	-	-	$P_{77}X\ I_0$	$P_{77}X\ I_1$	$P_{77}X\ I_2$
1976	-	$P_{76}X\ I_0$	$P_{76}X\ I_1$	$P_{76}X\ I_2$	$P_{76}X\ I_3$
1975	$P_{75}X\ I_0$	$P_{75}X\ I_1$	$P_{75}X\ I_2$	$P_{75}X\ I_3$	$P_{75}X\ I_4$

- P_X = PROBABILITY OF OCCURRENCE IN YEAR X
- I_Y = IMPACT OF EVENT Y YEARS FROM OCCURRENCE OF THE EVENT
- $I_{TOTAL_Y} = \Sigma I_{E_{1_Y}} + I_{E_{2_Y}} + \ldots I_{E_{\Sigma}}$
- \- ASSUMES COUPLING AMONG EVENTS AND EVENT IMPACTS IS NEGLIGIBLE

Figure 6. Expected value of an event impact

AVERAGE COST OF A PRESCRIPTION

(Constant 1970 Dollars)



Source: R.A. Gosselin & Company, IMS America.

Figure 7. A typical forecast obtained using trend impact analysis (TIA)

PROSPECTS reports are prepared using the TIA procedure and, as they represent material prepared to aid in real-world decisionmaking and planning, should prove useful in discussing the insights obtained from using TIA.

Initial or Baseline Extrapolation

It should be remembered that the impacts assigned to each event describe the estimated change in the surprise-free trend caused by the occurrence of that event. In the case of the average cost of a prescription an upper limit of $8 per prescription (in 1970 dollars) was set for the extrapolation. The extrapolation program rejected the first three curves generated because they exceeded this limit. The fourth curve remained within the limit and produced the solid line extrapolation shown in Figure 7. This, then, became the baseline to be impacted by future events.

Event Impacts

The events used in this TIA are shown in Figure 8. For example, the first event, the abolition of all product brand names, was judged to have a probability of .10 of occurring by 1985 and a probability of .15 of occurring by 1990. If this event does occur it is expected that its first impact on the average cost of a prescription will begin two years after the occurrence of the event. The maximum impact will occur after five years and will be a 20 percent reduction in the average price. The steady state impact is judged to be the same as the maximum impact.

The combination of these events, probabilities, and impacts with the baseline extrapolation is a forecast (Figure 7) markedly different from

EVENT	ESTIMATED PROBABILITY BY YEARS SHOWN		YEARS TO FIRST IMPACT	YEARS TO MAXIMUM IMPACT	MAXIMUM IMPACT	YEARS TO STEADY STATE IMPACT	STEADY STATE IMPACT
1. Abolition of all drug product brand names; standard abbreviations for generic names.	.10 .15	1985 1990	2	5	-20	5	-20
2. Drug reimbursement in all Federally funded health programs based on Maximum Allowable Cost.	.75 .75	1976 1990	5	5	-15	5	-15
3. Removal of all Federal and state restrictions on prescription price advertising.	.20 .60	1980 1990	0	2	-10	2	-10
4. Decrease in the average size of prescription by 20 percent.	.10	1985	0	2	-10	2	-10
5. Comprehensive health care package initiated, Federally run, Federally subsidized.	.50 .50	1980 1990	2	10	-10	10	-10
6. Period of patent protection reduced to five years after market introduction of product.	.40 .45	1984 1990	5	15	-15	20	- 5
7. Economic recession (similar to late 1950's).	.30 .35	1980 1990	0	2	-10	3	0
8. Federal and state legislation to allow para-professionals to perform more drug dispensing duties.	.25 .50	1984 1990	5	5	- 5	5	- 5
9. Anti-substitution laws repealed in most states.	.44	1985	1	10	- 5	10	- 5
10. Semi-automated drug dispensing equipment for use by pharmacists.	.50 .65	1980 1985	2	10	- 2	10	- 2
11. Number of prescriptions per user increases 10 percent over 1973 levels.	.40 .50	1980 1990	1	10	+ 5	10	+ 5

Figure 8. Event used in TIA of average cost of a perscription

the baseline extrapolation. The curve even begins to decline in 1987. The uncertainty is indicated by quartiles about 18 percent above and below the mean forecast. (The quartiles indicated the middle 50 percent of future values of the curve. Thus, 25 percent of the futures lie above the upper quartile, 25 percent lie below the lower quartile, and 50 percent lie between the two quartiles. Quartiles are presented here; however, since the computer program calculates the standard deviation, skewness, and kurtosis for each year, any part of the range could be printed out.) This uncertainty shown by these quartiles results from the fact that many of the events that have large impacts have relatively low probabilities--thus an uncertain situation prevails.

At this juncture, it is desirable to determine the sensitivity of these results to the individual estimates upon which they are based. For example, one might raise valid questions about the estimates of event probability, the magnitude of the impacts used, and the delay time associated with these impacts. Having prepared these data in a disaggregated fashion, it is extremely easy to vary such estimates and view the change in results. It may also be observed that intervention policies, whether they be institutional (such as lobbying, advertising, or new marketing approaches) or technological (such as increased R&D expenditures), can be viewed as a means of influencing the event probabilities or impacts.

Suppose, for example, a certain pharmaceutical company was in a position to lobby for the immediate removal of restrictions on prescription advertising, or suppose an analyst thought that the removal of these restrictions was much more likely than 20 percent in 1980. In each case knowledge of the sensitivity of the forecast to the removal of advertising restrictions would be

useful. This sensitivity can be tested by raising the probability of this event from .20 in 1980 to .90 in 1980. The result of this change is shown in Figure 9.

Figure 9 shows the sensitivity of the forecast to an early occurrence of this event is mainly during the 1975-1985 period. During this period the forecast is reduced by about 7 percent and the quartiles are similarly reduced. By 1990, however, when the probability of the event had already reached .60 in the first forecast, the difference is slight. The sensitivity of the forecast to each of the other events, or combinations of events, can be determined in a similar manner.

Thus TIA can be used, not only to improve forecasts of time series variables but also to study the sensitivity of those forecasts to policy. Of course, any policy considered should attempt to influence as many events as possible, rather than one, as in this simple example. Realistically, corporate actions often have both beneficial and detrimental possibilities, as they may enhance both desirable and undesirable possibilities. The use of such procedures as described here, however, should make such uncertainties more clearly visible than is possible with techniques heretofore available and allow us to live more comfortably with, and even to reduce, the degree of risk in our endeavors.

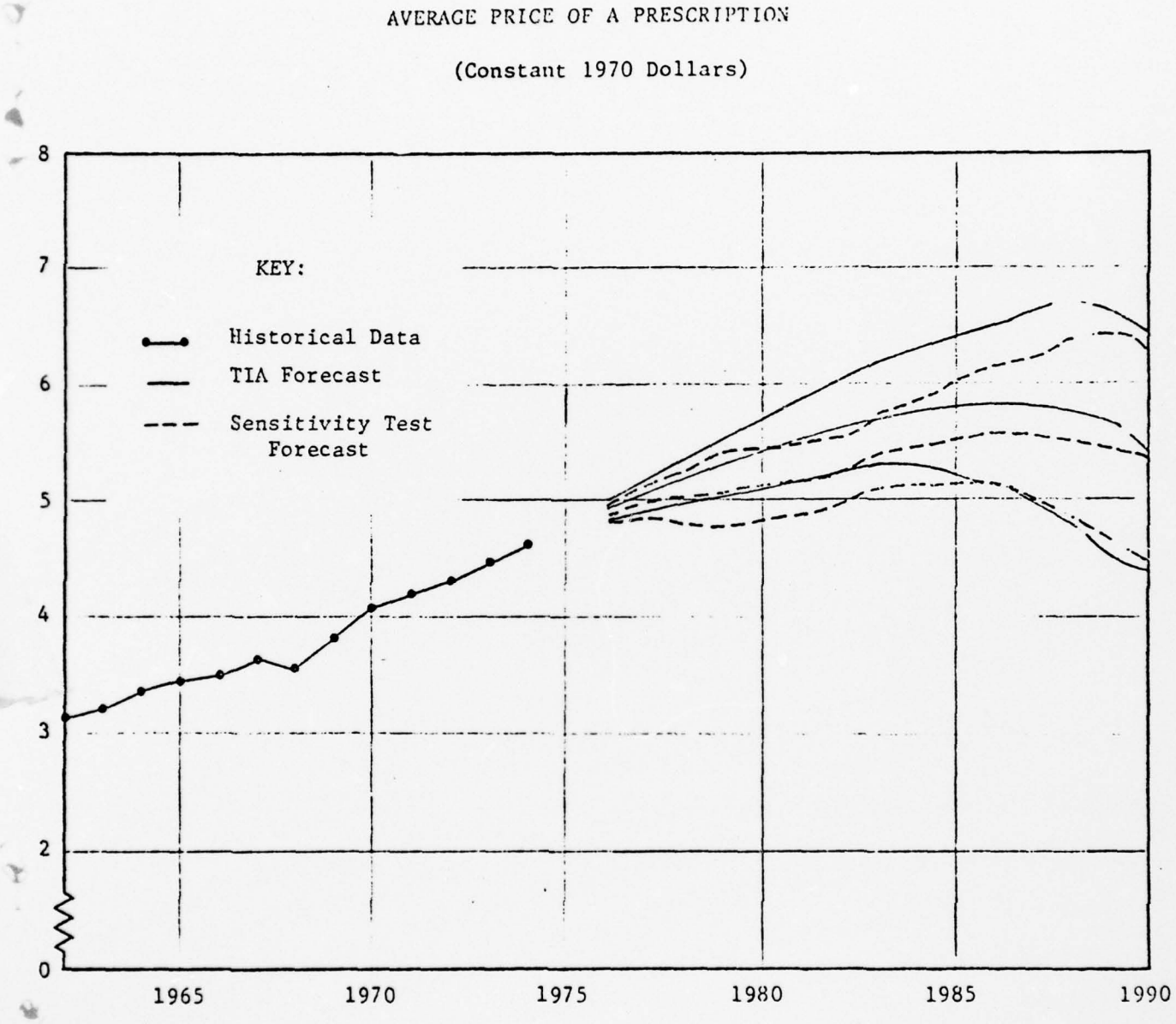


Figure 9. Sensitivity of test TIA forecast